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WITH ABSTRACT OF THE LITERATURE

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THE JOURNAL OF INDUSTRIAL HYGIENE

VOLUME XIII DECEMBER, 1931 NUMBER 10

THE PRODUCTION OF CARBON MONOXIDE FROM PAINT IN SEALED COMPARTMENTS*

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INTRODUCTION

CERTAIN air spaces in ships and other places may remain hermetically sealed over long periods of time. Such spaces are the double bottoms and "bulges," or "blisters," of warships. A bulge, or blister, is a space formed between the true side of the ship and an extra "skin" which forms part of the defense against torpedo attack. From time to time, when such compartments have been opened for inspection or repainting, men have entered them without taking safety precautions (such as those in the Admiralty regulations). As a result, dangerous collapse or sudden death has been reported. Sometimes these disasters have been attributed to poisoning with carbon monoxide, but in the majority of instances where the case has been properly investigated no trace of carbon monoxide has been found in the victim's blood. The cause of death is generally due to acute asphyxiation—the man being "drowned" in an atmosphere deficient in oxygen. One cause of the erroneous diagnosis of carbon monoxide poisoning, which is so often at first suggested, is that the skin in such cases of acute asphyxiation often retains its pink color, which, in a corpse, simulates the pink complexion characteristic of carbon monoxide poisoning. One such disaster occurred lately in a naval dockyard, where a man entered one of the bulges of a battle cruiser before the space had been forcibly ventilated, as required by the Admiralty orders. The man collapsed immediately and was dead when brought out. Death was at first attributed to carbon monoxide, but no trace of this gas was found in the blood which was collected at the postmortem. This blood was examined by the Hartridge reversion spectroscope in

* Received for publication July 27, 1931.

the manner described by one of us (R. C. F.) (1). This dockyard man obviously died of acute anoxemia due to the absorption of oxygen from the original air in the bulge. This disaster led to the investigations about to be described.

Chemical Investigations

A series of chemical analyses were made by the Admiralty chemists of the air in bulges and other sealed spaces. Newington has described the technic and details of these experiments elsewhere (2). In brief, it was found that the atmosphere of such spaces might contain less than 2 per cent. of oxygen without any proportional rise in the carbon *dioxide* content. The absorption of oxygen by the linseed oil in the paint used in sealed compartments was, however, an old observation, but the surprising discovery was made that the gas in such a space might contain as much as 0.2 per cent. of carbon *monoxide*. Experiments were made to determine the origin of this carbon monoxide. Iron oxide paint, such as is used in ships' bulges, was stored in sealed glass bottles for various periods. Chemical analyses showed percentages of carbon monoxide ranging from 0.08 to 0.27. The constituent of the paint which was responsible for this gas was the boiled linseed oil. In one experiment the gas in a drum which had contained boiled linseed oil and which had remained sealed for five months contained 0.21 per cent. of oxygen, 3.28 per cent. of carbon dioxide, and 0.35 per cent. of carbon monoxide. Thus there was actually more carbon monoxide than oxygen in this atmosphere.

It has been stated that small traces of formic acid occur in paint fumes. It was thought therefore that the carbon monoxide might have been produced by the decomposition of formic acid; but no traces of carbon monoxide were found in bottles in which formic acid had been stored for various periods at different temperatures. Gardner (3) in 1914 stated that carbon monoxide and carbon dioxide were evolved from drying linseed oil. His conclusions were adversely criticized by Klein (4) who considered that his technic for demonstrating carbon monoxide was unreliable. However, the presence of carbon monoxide in paint vapors was demonstrated in an entirely separate investigation by King (5), the publication of whose paper was prompted by Klein's critical survey of Gardner's work. As far as we are aware, King's findings have not been challenged. An examination of the technic employed by Newington (2) will show the care taken to eliminate fallacy.

Biologic Experiments

1. A hole was drilled in the bulge of a battleship, which had not been opened up for two years. Large samples of air were aspirated from the bulge and transferred to a laboratory. By chemical analysis these samples contained 1.3 per cent. of oxygen and 0.03 per cent. of carbon monoxide. When some of this air was bubbled through human blood, and the latter examined with the reversion spectroscope, carbon monoxide hemoglobin was demonstrated.

2. A guinea-pig was introduced directly into this atmosphere. The animal collapsed within five seconds and was apparently unconscious. Feeble convulsive movements and ir-

regular respiratory efforts continued for ten minutes; the animal then lay motionless, though an occasional respiration took place for a further six minutes. Subsequently a trace of carbon monoxide could be detected in this animal's blood by the reversion, but not by the ordinary, spectroscope.

3. A second guinea-pig was put in a 6-liter bell jar, the fresh air in which was slowly and continuously displaced by 12 liters of air from the bulge. After five minutes the animal began to show signs of respiratory distress; after fifteen minutes convulsions developed and the animal collapsed. It was, however, still alive after twenty-five minutes, when it was killed and the blood taken for examination. The amount of carbon monoxide in this animal's blood was appreciably greater than that found in the first animal. In neither animal was the concentration of carbon monoxide in the blood large enough to have any physiologic importance. It is obvious that these animals suffered or died from anoxemia, directly due to the small oxygen tension in the air from the bulge.

4. A 2.7-gm. sample of the iron oxide paint was sealed up in a glass bottle of 1,600-c.c. capacity for forty days. A mouse was then placed in the bottle. The animal showed no signs of distress but gradually became sluggish and finally unconscious. Death occurred after three and one-half hours. The blood of this mouse was found to be 70.3 per cent. saturated with carbon monoxide as estimated by the Hartridge reversion spectroscope.

5. In another experiment, similar in all respects except that 9 gm. of paint were used, the mouse died in two and one-half hours and the percentage of saturation was 84.2.

It is obvious that the chief cause of the death of these mice was carbon monoxide poisoning, which may have been accelerated by oxygen deficiency.

6. Three 1-liter bottles in which 10, 1.5, and 8.5 gm. of paint had been stored for fifty-five days were found to contain 0.27, 0.08, and 0.26 per cent., respectively, of carbon monoxide. Unfortunately the oxygen content was not estimated. But it would seem that under the conditions of experiment there must have been enough oxygen and enough carbon monoxide in the bottles used for the mice to support mouse respiration long enough to enable the animals to absorb a fatal concentration of carbon monoxide. According to Henderson and Haggard (6), in atmospheres containing an ordinary percentage of oxygen, 0.15 to 0.2 per cent. of carbon monoxide may cause dangerous symptoms to man within an hour, and 0.4 per cent. will generally be fatal within this time. They also state that 80 per cent. of saturation of the blood with carbon monoxide is rapidly fatal. These figures are consistent with the results of the experiments on mice.

Commentary

The sequence of events described in this report is interesting, because a preliminary but erroneous diagnosis of death from carbon monoxide poisoning, which was really due to acute anoxemia, started an investigation which proved that carbon monoxide was formed from paint in sealed compartments. However, the air from such compartments as were examined contained carbon monoxide in dangerous quantities only when the amount of oxygen present was too small to support life. Therefore, at first sight,

it appeared that detection of carbon monoxide in these confined spaces, though of academic interest, was of little practical import, because a man entering them would always be asphyxiated long before he had time to be poisoned by any carbon monoxide present. However, two facts put one on guard against accepting this conclusion as a general rule. First, it was noticed that there was no constant inverse relation between the amount of oxygen and carbon monoxide in these analyses, either of the air samples of the actual spaces themselves or of the artificial "paint extracted" atmosphere. Secondly, in the "artificial" atmospheres mice were able to survive three or four hours before dying, and since their blood after death was 80 per cent. saturated with carbon monoxide, they undoubtedly died from this cause. (The latter circumstance is still significant in spite of the fact that it is probable that small animals like mice can survive in a lower percentage of oxygen than animals as large as men.) If it should be possible for the air in confined spaces to remain respirable, and yet contain a dangerous concentration of carbon monoxide, then these observations become of practical importance. For instance, such a space may be considered safe because it will support the combustion of a safety lamp, whereas in reality there is present a lethal concentration of carbon monoxide.

This inference has received startling confirmation from a recent report of two disasters in the United States Navy (7). In the first disaster three men were overcome after working in a blister of the U. S. S. *Nevada* for one and one-half hours. In this case there is no question but that carbon monoxide poisoning was the correct diagnosis. The victims in the *Nevada* had been using an oxyacetylene torch, and the carbon monoxide which was subsequently found by analysis of the air of the compartment was suggested to have been produced by the incomplete combustion of the acetylene, but if the oxygen was turned on during the use of this torch the foregoing hypothesis becomes unconvincing. In the second disaster, in the U. S. S. *New York,* nine men entered an unventilated bulge; all were affected within a few minutes with symptoms which, in those that survived, were more consistent with carbon monoxide poisoning than with oxygen deficiency, and carbon monoxide is reported to have been found in the blood of the two fatal cases. In the *New York* accident the length of time that the victims were exposed to the dangerous atmosphere is unstated. The description of the event shows that at first attempts were made to get the men out without anti-gas apparatus, secondly a smoke helmet was used and discarded, thirdly another form of apparatus failed, and finally a mask and air hose were "secured from the navy yard fire department." Therefore we think it fair to surmise that the abortive attempts at rescue must have occupied at least half an hour before the men were got out of the blister. The length of exposure, combined with the fact that seven out of the nine men ultimately recovered, again suggests that carbon monoxide was the cause of the fatalities. The effects of a lowered oxygen tension would also augment the action of any carbon monoxide present, and accelerate the appearance of symptoms.

The United States reporter can suggest no source of origin for the carbon monoxide in the *New York's* blister. These American disasters combined with the present investigation leave little reasonable doubt that under unknown conditions the action of paint in confined spaces can produce a lethal concentration of carbon monoxide and at the same time leave enough oxygen to support respiration —at least for short periods.

Although on previous occasions carbon monoxide has been reported as a product of drying paint fumes, some chemists have not been satisfied that the technic used to demonstrate its presence was altogether above suspicion. In this instance, it is believed for the first time, a chemical analysis has been independently confirmed by biologic experiments. Moreover, the use of the Hartridge reversion spectroscope for the blood examinations excludes the possibility of mistaking such compounds as oxyhemoglobin and nitric oxide hemoglobin for carbon monoxide hemoglobin—mistakes which are sometimes made, by the unwary and inexperienced, when an ordinary spectroscope is employed.

Finally, from the practical hygienic point of view it would seem that the evolution of carbon monoxide from paint is too slow and the quantity too small to produce acute or chronic symptoms in any environment other than a hermetically sealed compartment. In this respect the type of poisoning described above presents an interesting analogy to the chronic arseniuretted hydrogen poisoning which was reported in certain submarines which had to do prolonged diving during the War (8). It is improbable that the traces of arsine which were produced from impure grids of secondary batteries, any more than the traces of carbon monoxide produced by paint, could ever accumulate in sufficient quantity to cause symptoms except in "sealed" compartments.

Summary

The air of some hermetically sealed spaces was found to contain traces of carbon monoxide.

The source of this gas was the boiled linseed oil used to make up paint.

The presence of carbon monoxide was demonstrated by chemical and biologic methods.

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PORTABLE MOTOR-DRIVEN IMPINGER UNIT FOR DETERMINATION OF SULPHUR DIOXIDE*

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THE determination of the sulphur dioxide content of the air is nearly always an essential part of investigations that pertain to problems of health and safety, damage to vegetation, and corrosion due to stack and chimney gases from coal and other sulphur-bearing fuel burning appliances, fires in refuse dumps around coal mines or cinder piles, gases from roasting and smelting sulphide ores, oil refineries, manufacture of sulphuric acid and other chemicals where sulphur dioxide is used or generated, and the escape of gas from refrigerating systems which use sulphur dioxide as the cooling medium. The amount of sulphur dioxide to be determined in these cases usually ranges from a fraction of a part to several parts per million by volume, and is below the amount that can be determined by the chemical procedures which are used for control work.

Methods have been devised for determining small amounts of sulphur dioxide in air (1) (2) (3, p. 420), but they have certain disadvantages, owing particularly to the cumbersome nature of the apparatus and its manipulation. With the objective of overcoming these disadvantages and devising a simpler type of instrument, the writers have evolved an apparatus which has been found to be more accurate and more satisfactory, particularly for field investigators, than those heretofore employed. It can also be used for the determination of other atmospheric contaminants by changing the absorbing liquid and the chemical procedure, but in this report the description will be confined to the determination of sulphur dioxide.

Figure 1 shows the parts assembly and the general dimensions of the equipment, which is essentially a modification of the impinger apparatus as described and used for the determination of atmospheric dusts (4). It consists of an absorption vessel (*A-F*) connected through an orifice meter (*H*, *I*) and a regulating manifold and by-pass (*J*) to a motor-driven vacuum pump (*K*). The absorption vessel is of the impinger type and the essential details with regard to the diameter of the nozzle opening (*B*), the distance of the nozzle from the bottom of the absorption vessel, and the air capacity are in accordance with those recommended for the dust collector type of impinger (4). The absorption bulb

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has been changed from that ordinarily used, by placing a constriction at the bulb above, minimizes foaming and prevents the air from carrying the

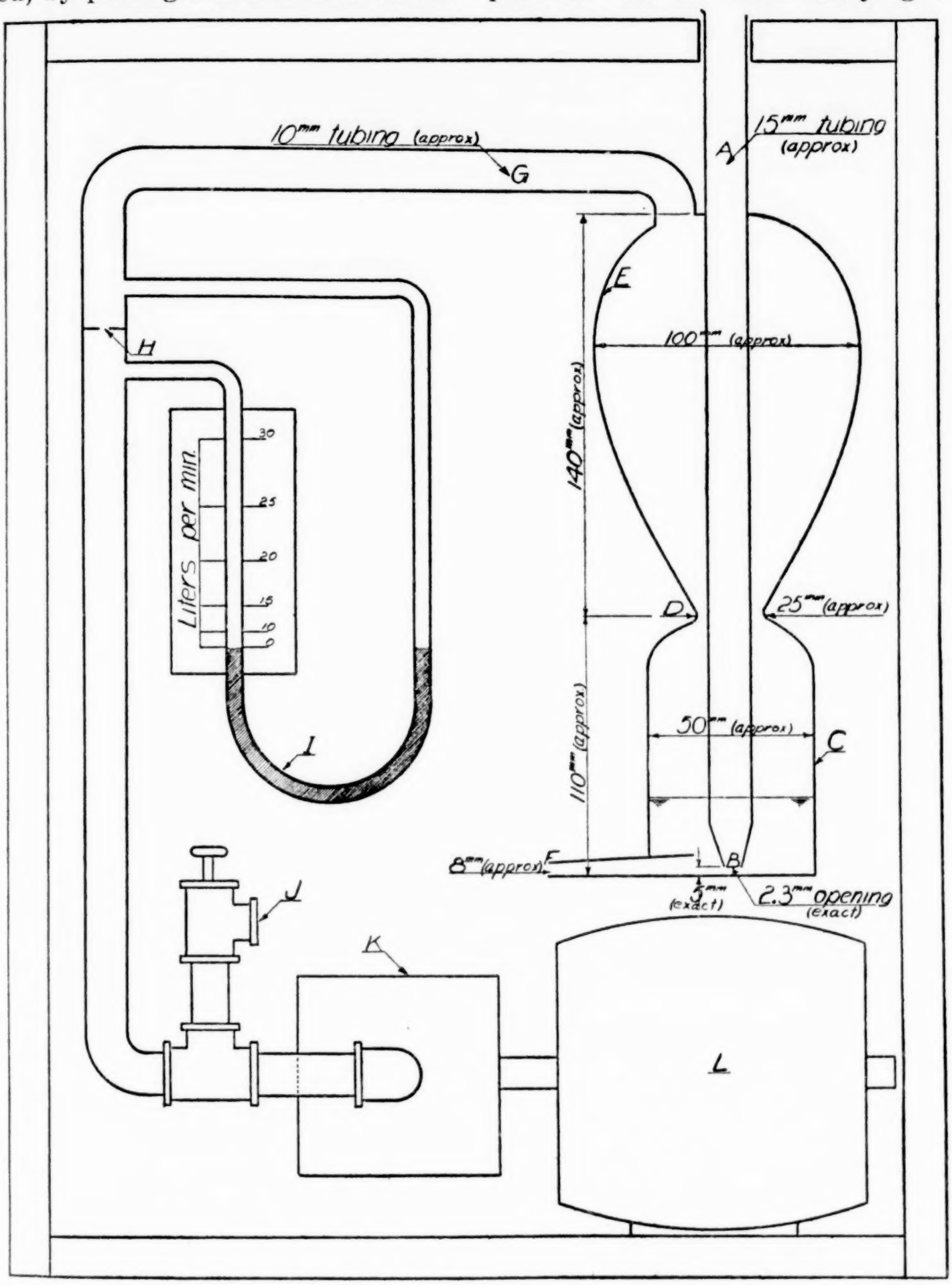

FIG. 1.—Diagram of impinger unit for determination of sulphur dioxide. For description, see text.

point (*D*) immediately above the section that contains the absorbing liquid. This constriction, with the expansion absorbing liquid from the bulb. The absorbing solution is admitted to the bulb through the air inlet (*A*), and

after use is removed through the liquid outlet (*F*), the latter being closed by means of a short piece of rubber hose and an ordinary pinchcock or screw clamp. The flowmeter is the ordinary orifice type with a liquid filled manometer (*I*) calibrated in liters flow per minute. The pump inlet manifold is essentially a T-connection, one side of which is joined to the pump, and another to the flowmeter; the third is fitted with a valve through which air can be by-passed to the pump. The flow through the meter (*I*) is set and regulated by adjusting the valve to increase or decrease the by-pass opening.

The motor and pump were designed to have a minimum weight, with sufficient power to draw 30 liters of air per minute through the absorption unit. The limit of power required was set at 10 amperes because specific requirements necessitated using the car battery for a number of samples each day. The average light discharge from a motor car battery is 10 amperes; therefore an unlimited number of samples can be taken without draining the battery below the point where it will be recharged by driving. If such exactness of weight and current required is not necessary, there are several makes of pumps and motors on the market which can be used to accomplish the same purpose.

The rotary pump now being used is of the eccentric barrel type, built to mount directly on the motor frame. The motor was rewound in series from a 110-volt motor to draw approximately 10 amperes at 6 volts under load. The armature was approximately 2 inches by 2 inches, and the commutator consisted of twelve segments of sturdy construction, with brushes $\frac{1}{4}$ inch square, and the field built of laminations. The frame used by the authors was that of an Emerson motor of 1/20 horse power, shunt-wound. The pump consists of an outer chamber 2 inches deep, bored out to a $2\frac{1}{2}$-inch diameter. Another boring of a 2-inch diameter, eccentric by 5/16, affords an approximate 90° arc bearing for the rotor. This relatively long bearing cuts down the capacity of the pump to a certain degree, but insures a good vacuum. The rotor is slotted to carry four vanes of bakelized linen which slide freely in the slots and maintain contact with the walls by centrifugal force. The inlet and the outlet of the pump are openings through the chamber walls adjacent to each side of the close-fitting portion of the rotor.

The motor can be operated by passing a 110-volt current through a transformer capable of handling 300 watts, or a 110-volt motor can be applied where work away from lighting circuits is not required.

The completed impinger is mounted in a case 7 inches deep, 9 inches wide, and $19\frac{1}{2}$ inches high. A suitcase type of handle on the top affords a comfortable means of carrying. The completed case weighs approximately 25 pounds. The practice of mounting the motor and the pump assembly directly on the bottom of the case affords stability, and it is impossible for a stiff breeze or a slight jar to tip the apparatus over. The cord from the power source is connected near the base, on the outside of the apparatus. A switch for controlling the motor is mounted inside the case.

The solutions used are: (1) approximately 0.1 normal sodium hydroxide; (2) approximately normal hydrochloric

acid; (3) 0.001 normal iodine; and (4) starch solution.

The 0.1 normal sodium hydroxide solution can be made fresh for each day of sampling by diluting from a normal solution. The normal hydrochloric acid is prepared from concentrated reagent hydrochloric acid. For each day the 0.001 normal iodine is prepared by diluting 0.1 normal iodine to that concentration. The sodium hydroxide and hydrochloric acid solutions, if prepared in the laboratory with reasonable care, do not require standardization; the 0.1 normal iodine, however, should be frequently standardized in order to insure accuracy.

TABLE 1.—CHART FOR DETERMINATION OF CONCENTRATIONS OF SULPHUR DIOXIDE

c.c. of N/1000 I_2	c.c. of SO_2 at various temperatures (°F.)											
	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°
1	0.112	0.113	0.114	0.115	0.116	0.117	0.118	0.120	0.121	0.122	0.123	0.124
2	0.224	0.226	0.228	0.230	0.232	0.234	0.236	0.240	0.242	0.244	0.246	0.248
3	0.336	0.339	0.342	0.345	0.348	0.351	0.354	0.360	0.363	0.366	0.369	0.372
4	0.448	0.452	0.456	0.460	0.464	0.468	0.472	0.480	0.484	0.488	0.492	0.496
5	0.560	0.565	0.570	0.575	0.580	0.585	0.590	0.600	0.605	0.610	0.615	0.620
6	0.672	0.678	0.684	0.690	0.696	0.702	0.708	0.720	0.726	0.732	0.738	0.746
7	0.784	0.791	0.798	0.805	0.812	0.819	0.826	0.840	0.847	0.854	0.861	0.868
8	0.896	0.904	0.912	0.920	0.928	0.936	0.944	0.960	0.968	0.976	0.984	0.992
9	1.008	1.017	1.026	1.035	1.044	1.053	1.062	1.080	1.089	1.098	1.107	1.116
10	1.120	1.130	1.140	1.150	1.160	1.170	1.180	1.200	1.210	1.220	1.230	1.240

Procedure

Fifty c.c. of 0.1 normal sodium hydroxide is placed in the absorption vessel and the unit is operated until the required amount of air has been scrubbed through the liquid. The liquid is then drained, preferably into glass-stoppered bottles; the stoppers should be waxed, if a number of samples are to be taken and later analyzed in the laboratory. This is especially necessary when night work is being done. The absorption unit is rinsed with approximately 10 c.c. of distilled water, which is added to the sample. This rinsing washes out, within experimental error, any absorption liquid retained on the side walls and bottom of the vessel. For cleansing after a series of tests, the vessel should be removed from the apparatus and properly washed.

The sodium hydroxide is neutralized with 6 c.c. of normal hydrochloric acid and 1 c.c. of starch solution. It is then titrated with 0.001 normal iodine, the iodine being added until a blue endpoint is reached. A blank of the reagents is titrated and the amount of iodine required for an endpoint is subtracted from the amount used in the sample. The parts of sulphur dioxide per million parts of air are determined according to the following formula:

$$1 \text{ c.c. N/1000 } I_2 = 0.032 \text{ mg. } SO_2 = 0.0112 \text{ c.c. } SO_2 \text{ at } 32°\text{F.}$$

$$\text{Parts per million } SO_2 = \text{no. c.c. titration} \times \frac{0.0112 \times (460 - \text{temp.°F.}) \times 10}{492}$$

Table 1 has been made for convenience. Any concentration from one-tenth to five parts per million can be determined from the chart. In titrating more than five parts per million, the volume of 0.001 normal iodine becomes so large as to dilute the sample to such an extent that a well-defined endpoint cannot be easily obtained. In such a case 0.01 normal iodine can be used and the results from the formulas should be multiplied by ten.

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THE DUST HAZARD IN THE ABRASIVE INDUSTRY: THIRD STUDY*

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BECAUSE of the wide use of artificial abrasives in industry the effect of the inhalation of their dusts by workers is of great practical importance. In two former studies (1) (2), the author has analyzed the hazard present at a large grinding wheel company.[1] This third study is to review the amount of pulmonary tuberculosis which has developed in the same plant during the past thirteen years.

The crystalline dust present in the workrooms is composed of aluminium oxide and silicon carbide. Careful attention to dust removal has been given where the hazard is present. No dust counts have been made. The exhaust pipes extract dust from the point at which it is produced, at a rate exceeding the stipulated 1,500 linear feet per minute wherever it is possible. There are some departments where the fineness of the product makes the engineering problem of dust removal extremely difficult, and in these departments there is a considerable amount of dust in the air.

It is a matter of general belief among those studying silicosis that the continuous inhalation of large amounts of any inorganic dust will in sufficient time produce fibrous changes in the lung, but that dust of high silica content produces these changes more surely and with greater rapidity. The terminal stage of silicosis caused by the inhalation of silica dust is almost invariably a type of pulmonary tuberculosis which is rapidly fatal.

The question has arisen as to whether the inhalation of artificial abrasive dust produces an increase in the incidence of pulmonary tuberculosis among those exposed. No experimental work on the effects produced by aluminium oxide dust has as yet been reported. The effect of carbide of silicon dust inhalation upon pulmonary tuberculosis in guinea-pigs has been studied by Willis and Gardner. Willis' (3) conclusions were as follows:

1. Guinea pigs were exposed for over three years to the inhalation of heavy atmosphere of a so called "hard" dust, made up mostly of silicon carbide (98 per cent).

2. The effects on the pulmonary tissues were unexpectedly slight in view of the character of the dust and the prolonged contact with it.

3. Guinea pigs thus exposed to silica dust did not appear to be unduly predisposed to pulmonary tuberculosis upon artificial infection.

In 1929, Gardner (4) reported the results of exposing guinea-pigs to the inhalation of quartz, granite, and carborundum dusts. Carborundum is a trade name for silicon carbide. These guinea-pigs had previously been in-

* Received for publication July 22, 1931.

[1] Norton Company, Worcester, Mass.

fected with R_1 strain of tubercle bacilli, which produces a mild form of pulmonary tuberculosis. This almost invariably becomes arrested in about two years. The results of his exposure of guinea-pigs with arrested pulmonary tuberculosis to the inhalation of the above-mentioned dusts Gardner summarizes as follows:

> The experiment has demonstrated that the inhalation of these three dusts will stimulate a renewed multiplication of bacilli in the healing tubercles, an effect which is often followed by widespread chronic ulcerative tuberculosis. All the manifestations of that condition seen in man, with the exception of caseous pneumonia, have been encountered. At least two months' exposure to the dusts is necessary to affect the primary foci of infection, and usually more time is required. Reactivation of primary tubercles has occurred as late as 206 or even 400 days after infection. With quartz, 73.6 per cent of the animals exhibited evidence of progressive tuberculosis, with carborundum there were 31.8 per cent, and with granite only 26.3 per cent. This result has not been obtained by the inhalation of all types of dust. Marble and soft coal have exhibited no stimulating effect. The reaction appears to be a specific result of the inhalation of certain definite types of dust, for evidence has been produced to show that factors like overcrowding, lack of proper ventilation and light, endemic pneumonia and nonspecific inflammations have not influenced this type of tuberculous infection.

In the plant under consideration, from Jan. 1, 1918 to Dec. 31, 1930 there have been forty-two cases of active pulmonary tuberculosis, thirty-eight of which have occurred among men and four among women. Of the group, thirty-seven were employed at factory work of some kind, while five did only clerical work.

Of the forty-two workers who developed tuberculosis, twenty are dead, eighteen are living, and four cannot be traced. Of the eighteen living, thirteen are now working, three are at home under the care of a physician, and two are in hospitals. The average number of employees during the period (thirteen years) has been 2,460.

Of the cases of active pulmonary tuberculosis developing during the period, thirteen occurred among workers in departments where artificial abrasive dust was present in large quantities, and two occurred among those working in clay which contains 9 per cent. of free silica. Twenty-two worked in departments such as the machine shop, packing rooms, etc., in which there was no dust hazard, and five were office clerks who had no contact with dust.

Of those who developed active pulmonary tuberculosis in the departments where abrasive dust was prevalent, three developed symptoms in less than one year, six in less than four years, one in five years, one in fifteen, one in twenty, and one in twenty-one years. Four of these developed the disease immediately following an attack of influenza and after very short exposure to dust. Of those working in clay dust, one developed the disease after twelve years' and one after thirty-six years' service.

Among those working in abrasive dust departments, in proportion to the number of workers involved there were approximately twice as many cases of pulmonary tuberculosis as among those in the departments where no abrasive dust occurred. It was stated that in four of the cases in abrasive dust departments the pulmonary tuberculosis developed immediately following

an acute attack of influenza. If these cases are omitted, the number which might be attributed to dust excitation of a latent process is reduced to nine, or a proportion of one and one-half times as many cases as occurred among those working in departments where there was no abrasive dust hazard.

In a previous study (2) eleven cases of inactive tuberculosis were disclosed by X-ray among 137 films of the chests

TABLE 1.—COMPARISON OF RATE OF PULMONARY TUBERCULOSIS PER 10,000 IN CITY OF WORCESTER AND IN NORTON COMPANY, 1918 TO 1930

YEAR	CITY OF WORCESTER	NORTON COMPANY
1918	18	13
1919	16	17
1920	18	11
1921	12	12
1922	13	17
1923	12	12
1924	11	14
1925	11	12
1926	11	15
1927	10	12
1928	7	20
1929	9	10
1930	9	8
Average....	12	13

cester (Tables 1 and 2). As all cases in the City are not reported, and as we believe that every case appearing in the factory period is known, it appears that the incidence is no higher than in the City at large. On the other hand, twice as many cases appeared in dusty as appeared in non-dusty departments.

TABLE 2.—COMPARISON OF CASES OF TUBERCULOSIS AND DEATHS FROM THIS CAUSE IN CITY OF WORCESTER AND IN NORTON COMPANY, 1918 TO 1930

YEAR	CITY OF WORCESTER			NORTON COMPANY		
	Cases	Deaths	Population	Cases	Deaths	Population
1918	326	183	187,492	3	0	2,300
1919	306	174	190,000	4	0	2,400
1920	329	158	179,754	4	3	3,673
1921	223	132	179,754	2	2	1,699
1922	228	124	179,754	3	1	1,716
1923	212	124	179,754	3	1	2,440
1924	224	123	196,200	3	1	2,133
1925	205	111	190,757	3	2	2,409
1926	211	122	190,757	4	4	2,684
1927	185	126	192,242	3	1	2,479
1928	142	128	192,242	5	5	2,537
1929	181	110	200,000	3	0	2,906
1930	181	97	196,837	2	0	2,622

of men exposed for ten years or more to the inhalation of abrasive dust. None of these workers have shown signs of tuberculosis activity before or since the pictures were taken.

From the figures so far presented it is impossible to draw any definite conclusions. The rate of pulmonary tuberculosis per 10,000 persons for the factory as a whole is, on the average of thirteen years, a shade above the rate of reported cases in the city of Wor-

This would tend to agree with Gardner's experimental findings with silicon carbide dust. In a personal letter, however, Gardner stated that he was unable to show the same activation of pulmonary tuberculosis with aluminium oxide dust (unpublished) as he did with silicon carbide. The factory workers are exposed to over ten times as much aluminium oxide dust as they are to silicon carbide dust.

About the only conclusion which can

be drawn from the present study is that it is inadvisable for persons who have had pulmonary tuberculosis to work in a department in which large amounts of artificial abrasive or any other dust are present.

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HEAT CRAMPS IN INDUSTRY: THEIR TREATMENT AND PREVENTION BY MEANS OF SODIUM CHLORIDE*

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INTRODUCTION

THE occurrence of muscle cramps among workers exposed to unusual heat has been known for many years, but the condition has received scant attention in medical literature. Steelworkers, miners, ships' stokers, and foundrymen, in many localities, have come to regard painful and disabling muscle cramps as among the vicissitudes of their trades. They have been in the habit of treating them according to their own ideas, often not even reporting their condition to the plant physician; and when they have sought treatment by the physician they were usually given little help.

These cramps are often called "heat cramps," "miners' cramps," and "muscle cramps," and are sometimes erroneously termed "the bends." They consist in painful, tonic spasms of any of the skeletal muscles, but usually of those most actively in use. The following description of a typical attack may be illustrative:

On a hot, sultry Monday morning in June, immediately following a week of cool weather, Jimmy Smith, who is a thin, wiry man of 35, went to his work as a rougher in a steel rolling mill without quite his usual enthusiasm, owing to a headache from too much Sunday night home-brew and not enough sleep. After two hours of hard work near the hot rolls, his thin, sleeveless shirt, which was already caked with salt from previous days' sweating, was drenched with perspiration. He had taken several drinks of water and was becoming thirstier all the time. After two hours more his head was swimming, his throat was dry in spite of the 2 quarts or more of water which he had drunk, and he had an all-gone feeling in the pit of his stomach. In spite of the profuse sweating, he had voided several times. He had already felt several momentary cramps in the muscles of his thighs, but these disappeared after a few minutes' rest. He drank more water in an effort to keep up what he had begun to feel was a losing battle. The buzzing in his head continued and he was conscious that his heart was beating faster than usual. He began to have such severe cramps in the flexor muscles of his forearms that he had to stop and rest. Finally he reported to his foreman that he had to quit. He went to the locker room to take a shower, and while sitting on the bench trying to undress, he was seized with such terrific cramps in the muscles of his abdomen, back, and arms that he groaned and rolled on the floor in agony. He was carried to the plant dispensary by other employees. When he arrived there his face showed an ashen pallor and his skin was cold and clammy; his pulse was rapid and thready, and he was breathing rapidly. Any attempt to sit up made him writhe and groan with cramps in his abdominal muscles, which stood out like bands and felt as hard as a board to the examiner's hand. Passive movement of his arm brought on further terrific contractions of his flexor muscles, which held his wrists flexed and his fingers so tightly clenched that they could not be pried open for several minutes. When he was lying perfectly quiet and undisturbed,

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the cramps would cease, only to recur at the slightest attempted movement. During a generalized tonic spasm of his forearms and legs, the position of his hands and feet resembled somewhat the carpopedal spasm of tetany. He asked for water, but was unable to keep it down. Morphine had little effect on the painful spasms, which gradually became shorter and less frequent during the next few hours, as he lay perfectly quiet. After three hours in a recumbent position, he was taken home in the automobile of a friend. On the way, he was doubled up several times with terrific cramps, but finally in bed, he felt better and had only occasional cramps. After a supper of coffee and boiled ham he felt somewhat refreshed and had only fleeting spasms subsequently. In the morning he felt "all washed out," but the cramps were gone. His muscles were sore all over, as "though he had been beaten." He did not attempt to work that day, although he had no cramps. On the second day he still felt too weak to work, but on the third day he returned to his job, feeling fairly fit.

Review of Literature

Coplin (1), who in 1892 was requested to attend the men working in a sugar refinery who were suffering from the effects of high temperatures, found that the most constant symptom of which the men complained was cramps, usually referred to the region directly below the ensiform cartilage but not infrequently associated with pains in the calves of the legs, occasionally in the back, sometimes also in the hypogastrium, and less commonly in the thighs and upper extremities. Edsall (2), in 1904, reported two cases of transitory myokymia and myotonia which in all probability belong in the group of heat cramps; and four years later, he reported two more cases under the title, "A Disorder Due to Exposure to Intense Heat" (3). He was able to find practically nothing in the literature concerning this unusual type of muscular cramps, but discovered that the condition was well known on shipboard, especially among stokers, and that several cases had been noted in the Surgeon-General's Reports. In his first report, Edsall speculated concerning the possible relation between the cramps and the marked arteriosclerosis present in one of his patients. Referring to the cases previously reported when addressing the Association of American Physicians, Edsall (4) mentioned the fact that Elliott of the Navy had used salt solution in treating some of these cramps. The author had noted in two of his cases that during the attack of cramps and several hours thereafter, the excretion of chlorides in the urine was practically nil. Welsh (5) reported over fifty cases of heat cramps treated with apomorphine. May (6) reported two cases occurring on the S. S. *Charleston*. Weisenburg (7) reported the case of a man 41 years of age who had recurrent attacks of cramps of such severity that his shoulder was dislocated. The patient had been an alcoholic. Weisenburg noted that the spinal fluid showed an increase in the number of cells. Johnson (8) quotes Gauss and Meyer as finding casts and albumin in the urine, and Gradwohl as observing findings similar to those of renal insufficiency.

Moss (9), writing upon "Some Effects of High Air Temperatures and Muscular Exertion upon Colliers," noted that while working in the heat the men ate more, regardless of the depressant effect of higher temperatures upon the appetite, and that the voluntary intake of salty food was increased. He found that an unaccli-

matized person could not sweat with the same efficiency as an acclimatized person, and that a current of hot air blowing on the skin, or a coating of dust on the skin, would interfere with evaporation. He noted that the cramps usually came on during the second half of the shift and that they always occurred in the muscles actually under strain at the time. J. S. Haldane suggested that loss of chlorides in the sweat was the etiologic factor, and proposed the administration of salt to compensate for this loss. This phase of the subject will be discussed later. Phelps (10) reported 105 cases of cramps in the United States Navy within eighteen months. The attacks usually lasted forty-eight hours. Thrower (11) commented briefly on cramps among the engine room workers of a motor vessel, for which salt water had been used as a prophylactic measure to a limited extent. Haldane (12) discussed the latter report, explaining the phenomenon as an osmotic pressure relation, due to loss of salt and to "water poisoning."[1] He referred to the lack of chlorides in the urine in these cases during the cramps.

Just what relation the cramps bear to the syndrome of heat exhaustion is not clear. Both are brought on by unusually high surrounding temperatures with a relatively high humidity. It seems likely that violent muscular exertion may be the factor which causes the cramps. There is, however, probably some individual susceptibility which renders some men more liable to have cramps while others suffer from symptoms such as general depression, headache, malaise, dizziness, anorexia, nausea and vomiting, diarrhea, epigastric distress, restlessness, insomnia, and polydipsia, which are described by Johnson (8) as associated with heat exhaustion. Some of these symptoms commonly precede the development of cramps, but it is not uncommon for workers to complain of similar symptoms without cramps, during the hot months. Sayers and Harrington found that dizziness, physical weakness, inability to think quickly or accurately, nausea, and headache were common complaints in still air in metal mines with a wet bulb temperature of over 90°F. and under 100°, and with a relative humidity of 89 per cent. or higher, even when little or no exercise was taken. The more serious degrees of heat exhaustion, with convulsions and marked hyperpyrexia (1), are rare at the moderate temperatures existing in Cleveland, even during the hot months, and we have had little experience with them.

The objective evidences of exposure of the body to extreme heat are: increase in body temperature, increase in pulse rate and blood pressure, vasomotor changes, changes in blood concentration, increase in the secretion of sweat, hyperpnea, loss of body weight, and increase in body metabolism. Bernard (13) demonstrated on animals what he regarded as the "toxic effects of heat," which were exerted chiefly on muscles. Edsall (3) regarded the muscular twitchings and spasms in his cases as due to faulty metabolism within the muscles themselves. Johnson (8) quotes Pembrey, Wooley, Vaughan, Gordon, and Gradwohl as believing that heat exhaustion is due

[1] See also Rowntree, L. G.: Water Intoxication. Am. Jour. Physiol., 1922, *59*, 451.

to retention in the tissues of some product that prevented normal heat loss, perhaps a split protein. Kober (14) refers to the symptoms of heat exhaustion and cramps as being influenced by toxins generated within the body. There is much evidence, however, that the symptoms of heat exhaustion and muscular cramps result from the effort of the organism to prevent an increase in body temperature. Evaporation of water from the lungs and the skin, as well as direct radiation and conduction of heat from the surface of the body, is involved in the body's efforts to protect itself against overheating. Evaporation from the skin carries a large part of the burden, while sweating serves as an emergency measure to prevent increase in temperature within the body. In a patient, in whom the absence of sweat glands was demonstrated (15), evaporation was able to prevent a rise in body temperature even with moderate exercise, but with marked increases in external temperatures, the body temperature rose. Schereschewsky (16, p. 659E) states that of the heat lost by the body, 73 per cent. is by radiation, conduction, and convection, 14 to 15 per cent. by evaporation, and 7 per cent. by vaporization from air in the lungs. Barbour and associated observers (17) have shown the importance of blood dilution and concentration, as well as of vasodilatation and constriction. They demonstrated that in response to external cold, blood concentration took place, with accumulation of plasma in the muscles, subcutaneous tissues, and skin. They felt that the layer of fluid close to the surface of the body served as an insulating medium in the prevention of heat loss when the body was exposed to low temperatures. There is some evidence to show that a similar anhydremia appears when the body is exposed to extreme degrees of external heat. Underhill and his associates (18) have called attention to the anhydremia following severe burns, which is dependent upon the increased permeability of the capillaries. Barbour, Dawson, and Neuwirth (19) showed that as a preliminary to sweating, water, salt, and lipoid accumulated in the blood serum. Gross and Kestner (20) found that the blood dilution accompanying sweating resulted from the outpouring of plasma from the muscles. When work and sweating stopped, the blood became concentrated again. Cohnheim and his associates (21) thought that the concentration took place only when muscular exertion accompanied sweating. Plaut and Wilbrand (22) and Eckert (23) felt that the concentration took place as a result of sweating, without any relation to exertion. Cohn (24) agreed that the outflow of plasma from muscles was compensatory and bore no relation to muscular work. Lozinsky (25) found that the blood dilution took place only as long as the heat regulation was in process. Barbour has called this a defense reaction against too great a salt loss by sweating. Flinn (26), in experiments on dogs, was able to demonstrate blood concentration only. Blood concentration following prolonged sweating was further observed by Young and his coworkers (27), and McConnell and Sayers (28) noted that hemoglobin concentration increased proportionately with the amount of weight lost. The water and salt that goes into the blood stream at the expense of the muscles during sweating is

lost rapidly in the sweat and the urine. Water without salt ingested during this period is not retained, but is quickly lost through the sweat and the urine, without replenishing the store of plasma in the muscles (29) (30) (31). This inability of the organism to retain fluid unless salt is supplied with it has an important bearing upon the production of heat exhaustion and cramps. As thirst increases and enormous quantities of water are drunk, the secretion of sweat and urine is profuse, and salt is washed out which is not being replaced. Muscular exertion places further demands upon the failing supply of water and salt in the muscles, until cramps ensue. It has been demonstrated by Edsall (3), Talbert and Haugen (31), Talbott and his collaborators (32), Moss (9), and Adolph (33) that as a protective mechanism during these periods of extreme salt loss the excretion of chlorides in the urine may fall to almost nil, and the diminished salt excretion continues for some hours after the normal balance and concentration in the blood is restored. During the period of diminished urinary chloride output, the excretion of phosphates is increased. Baird and Haldane (34), after studying the diuresis caused by ingestion of hypertonic salt solution, concluded that it was independent of the amount of water ingested and that salts were less mobile within the body than water.

Varying values for the amount of salt excreted in sweat have been given, and it is probable that the concentration varies considerably. It was observed by Talbert and Haugen (31), Kittsteiner (35), Viale (36), McConnell and Sayers (28), Marschak and Klaus (29), and others that the concentration of salt in the sweat increases with prolonged secretion. The average percentage of sodium chloride in sweat is given by Moss (9) as 0.224 per cent. Schereschewsky (16) quotes Hunt as giving the figure as 0.21 per cent. McConnell and Sayers (28) give the minimum value of sodium chloride as 0.17 per cent. and the maximum as 0.45 per cent. Higher values of 0.43 to 0.83 per cent. of sodium chloride are reported by Talbert and Haugen (31), and 0.64 to 0.74 per cent. by Cramer (37). According to the analysis of J. I. Graham, quoted by Moss, sodium chloride makes up 59.3 per cent. of the salt in sweat and potassium chloride 40.7 per cent. Johnson states that a man lying in the sun on the sand loses 280 gm. of water per hour. He states also that four men lost an average of 3 pints of water by perspiration on a march of 7 miles. Talbott and his coworkers (32) found that a man running for two hours on a treadmill, at a speed of 6.4 miles per hour, lost approximately 3.4 gm. of chloride during each experiment.

Moss (9) credits J. S. Haldane with the suggestion that the cramps suffered by miners are due to salt loss. On the basis of this suggestion a group of miners were urged to drink only salt water (10 gm. to the gallon) while working. It will be recalled that salt solution had been used empirically in the treatment of cramps some years before (4). The observations of the miners who were using the salt water were encouraging. Most of them had no further cramps and they complained of less fatigue than formerly. It was observed that the men using the salt water did not drink such large quan-

tities of water as the others, and this was regarded as a distinct advantage. On the basis of the sweat analysis previously mentioned, Moss recommended the use of both sodium chloride and potassium chloride in the water, in the proportions of 60 per cent. and 40 per cent. In this connection, Högler and Ueberrack (38) found that potassium chloride served as a diuretic when the body was depleted after sweating, while sodium chloride did not have this effect. They inferred from this that the fluid excreted in sweat came chiefly from interstitial fluid and not from cell fluid. The diuretic effect of the potassium salt renders its use during periods of serious depletion less desirable than sodium chloride, although theoretically a combination of the two is advantageous. Moss called attention to the fact that in the Pendleton Pit some miners were in the habit of using a small amount of cream of tartar (potassium bitartrate) in their water.

In their studies at the Institut für Arbeitsschutz in Moscow, Marschak and Klaus (29) and Marschak and Dukelsky (30) concluded that the drinking of a 1 per cent. solution of sodium chloride by the workers offsets the salt imbalance resulting from sweating. They confirmed the fact that only by simultaneous administration of salt could ingested water be retained by the tissues during intervals of depletion due to sweating. They found that the blood concentration accompanying muscular exertion and sweating was much less when salt solution was administered, and that the workers who used the solution were less subject to symptoms of fatigue and heat exhaustion. They made no observation concerning cramps. They concluded that the dosage of salt necessary depended upon the character of the work, its duration, the temperature, and the humidity.[2]

In recent years, dextrose solutions have been used extensively in some of the large steel mills in the United States in the treatment of heat cramps. While no extensive reports of the results of such therapy or explanations of its rationale are available in the literature, personal observations of some of the physicians in these mills would tend to show that cramps are relieved. So far as we are aware, no effort has been made to use dextrose prophylactically. Since the dextrose is usually given intravenously in physiologic salt solution, it seems quite likely that whatever results are obtained from the therapy may be due to the salt content. It is possible, however, that dextrose may aid in the mobilization and utilization of salt stored in the tissues and needed by the muscles. We have made no personal observations with the use of dextrose.

Clinical Observations[3]

Late in the summer of 1926, we began treating cramps among employees of the Otis Steel Company and the United States Aluminum Company, in Cleveland, by giving them salt solution. The relief afforded was almost immediate. During the first half of the summer of 1927 the method was continued.

[2] Sayers and Davenport have published an excellent "Review of Literature on the Physiological Effects of Abnormal Temperatures and Humidities" (39).

[3] We are indebted to Professor Philip Drinker of the Harvard School of Public Health for many helpful suggestions concerning this problem.

By this time the results were so convincing that we felt little doubt that salt loss was the chief factor in the production of the cramps. Accordingly, during the latter half of the summer of 1927 we began to popularize the idea of adding salt to the water drunk by the workers. At first the method of administering salt was rather hit-or-miss. The men were encouraged to bring salt with them or to procure envelopes of salt at the plant dispensary, and to add a pinch of it to each drink of water taken. Some of the drinking fountains were supplied with salt shakers. The disadvantages of these methods of administering salt were soon obvious. In the first place, it was difficult to get the complete co-operation of the men. Then, too, we could never be sure that enough salt was taken to compensate for the amount lost in sweating. In spite of these difficulties, the incidence of cramps was considerably reduced and symptoms of heat exhaustion were less common.

It seemed more desirable to furnish the employees with a definite amount of sodium chloride in the form of tablets which could be easily swallowed without being dissolved in the drinking water. The taste of the salty water was disagreeable and the men would not drink it consistently. Tablets and dispensing machines were made for us by the McKesson-Hall Van Gorder Company of Cleveland. At first, 10-grain sodium chloride tablets were used, but this amount was soon increased to 16 grains in a hard, compressed tablet, only slightly larger than the ordinary 5-grain tablet of acetyl salicylic acid. Recognizing that the workers lost as much as 2 or 3 gm. of sodium chloride in an hour of hard work, we felt that the larger tablets would be more certain to provide protection against excessive salt loss. If one of these tablets is swallowed with each drink of water, the maximum salt loss is usually compensated for, since the worker will drink two or three times an hour while doing work which involves marked muscular exertion in extreme heat.

Our observations confirm those of others in regard to the smaller water intake of the workers using salt with the water. The men drink less often and take smaller amounts at a time; yet they find that their thirst is quenched. Dispensing machines placed on the wall immediately above drinking fountains, with appropriate signs, remind the men to take a salt tablet every time they take a drink. We have found that to make any procedure successful among the personnel of a large mill, it must be so simple that it is just as easy to do it as not to do it. If the men have to ask for salt or tablets, there are many who will not do so, even though they recognize that it may save them suffering and disability. This fact is borne out by our experience during the present summer (1931). Along with the general let-down accompanying the industrial depression, the dispensing machines in a certain mill were out of order, and it was left to the superintendent to see that envelopes of tablets were regularly distributed. Not infrequently it was necessary for the men to go to the foremen or the superintendent for tablets. When jobs are at a premium, as they are at present, the worker will often risk his health rather than give his superior officer reason to think that

he is not entirely on the job. He will risk getting cramps rather than apply for more tablets. As a result of this situation, in one mill we had one severe case of cramps, causing several days of disability, and several minor cases, before the condition was corrected. Thus, in the first few hot days of the summer, more time was lost from cramps than during the two previous years together.

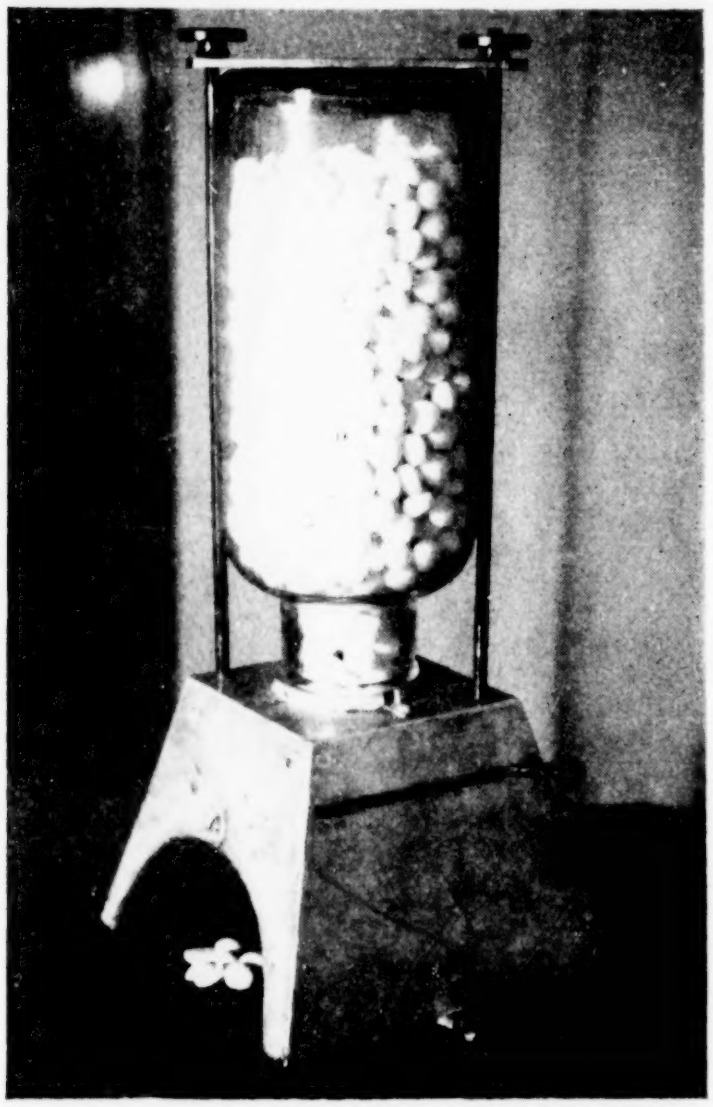

FIG. 1.—The first salt dispensing machine made by the McKesson-Hall Van Gorder Company, Cleveland.

We have experimented with several types of dispensing machines, some of which are illustrated (Figs. 1 to 3). To be satisfactory, the machines should be substantially made, but very simple in construction. It is also important that they be inexpensive, in order that the cost of placing them throughout the plant will not be unreasonable. Aluminium serves satisfactorily for the working parts of the machine, because it is little affected by the salt. In general, machines using a rotating plate which drops one tablet at a time are the most satisfactory. Springs are to be avoided as far as possible, because they soon corrode and break.

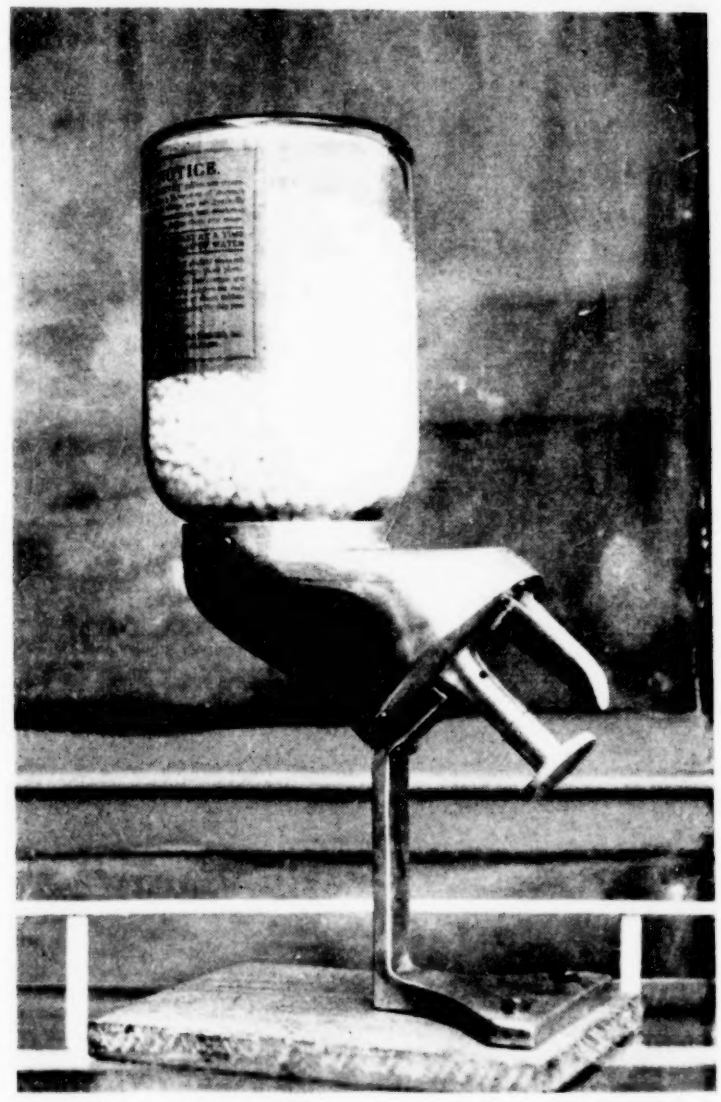

FIG. 2.—Salt dispensing machine made by the Fairway Laboratories, Belleville, Ill.

It is difficult to produce statistical evidence to show the success of the effort to prevent disability from cramps and heat exhaustion by the prophylactic administration of salt. There were no statistics available on the time lost from cramps before the use of salt in the industries with which we have been working, and we know of no satisfactory statistics on time lost from cramps in other industries. Our own

observations during a period of about a year before we started using prophylactic salt dispensing were vitiated from a statistical standpoint by the fact that our propaganda induced many of the men to come in for treatment of their cramps, whereas formerly they had gone home without reporting their condition. For this reason, during the summer months of 1927, when little effort has been made in the past to eliminate them.

The most convincing evidence we can produce is that cramps, which were common before, have practically disappeared since the introduction of the use of salt prophylactically. Furthermore, plant superintendents have been almost unanimous in their observation that during the hot months their men

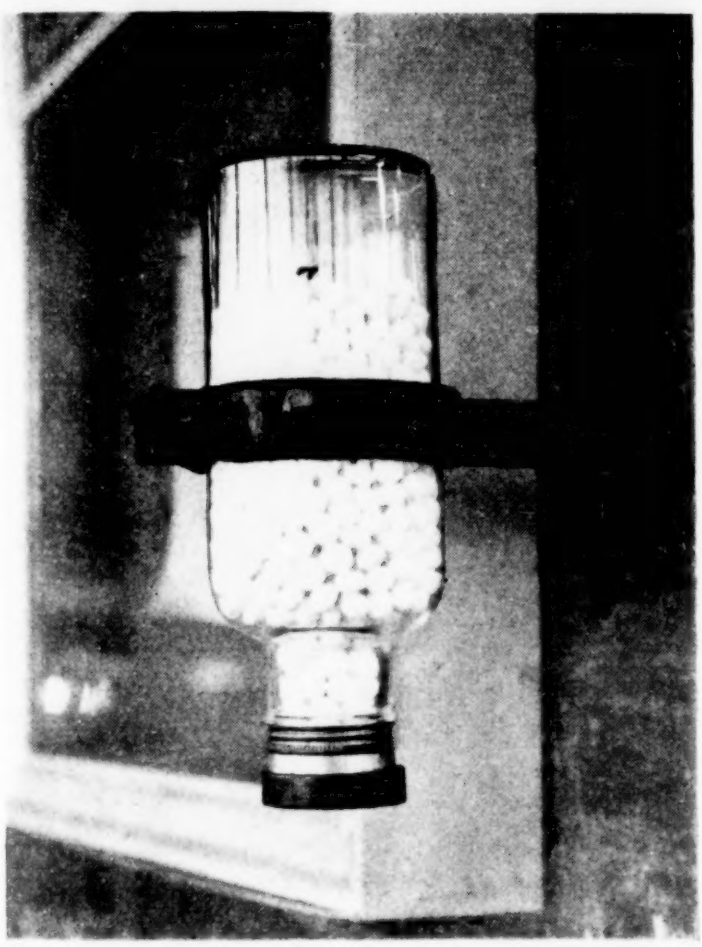

FIG. 3a

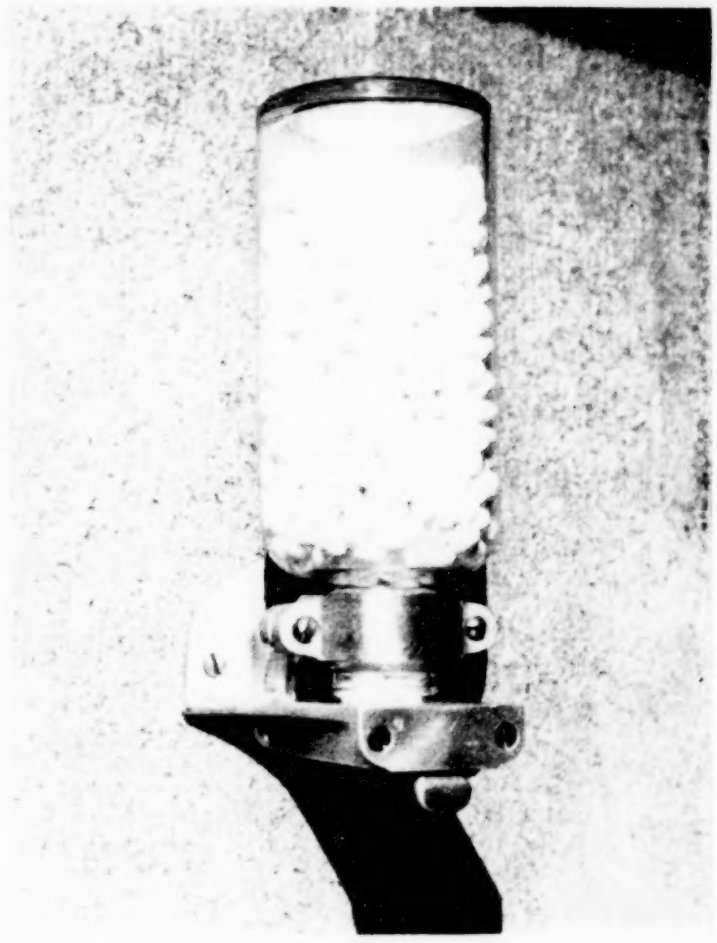

FIG. 3b

FIGS. 3a AND 3b.—Two simple salt dispensers made and used by the United States Aluminum Company, Cleveland.

we were attempting to popularize the use of salt, we saw more cases of mild cramps than we had previously. Time and again we were told by the men that they often had mild cramps but did not report them. Statistical evidence concerning heat cramps will never be particularly convincing, at any rate, because the time lost with each case of severe cramps is not great. That is probably the reason why so

are able to work more steadily and to produce more when they are taking salt regularly. These observations are, of course, subject to error. The workers have co-operated surprisingly well with the plan, and the more intelligent ones who have worked for many years in the steel mills are enthusiastic users of salt. The men have repeatedly told us that when they take salt regularly they do not become so thirsty,

they do not have cramps, and they are less liable to have the minor symptoms of fatigue and heat exhaustion. The enthusiasm of some of the men, however, must be literally "taken with a grain of salt," because they are inclined to take one of the salt tablets for constipation or any other ailment.

There will always be a few men who do not follow the rules, and among this group there will always be a few cases of cramps. In plants where salt is being used, however, a man who has not been taking the tablets regularly will usually take some at once if he begins to have cramps, and will be saved from the severe spasms. The taking of salt at this stage, however, will not prevent the cramps entirely.

In a plant with from 1,000 to 1,800 employees, where heat cramps had previously been very common, after the introduction of salt prophylaxis there was no time lost from this cause during the years 1928, 1929, and 1930. In a steel mill employing from 3,000 to 3,500 men, there were forty-eight days lost from heat cramps in the summer of 1927. After the use of salt tablets was begun, the number of days lost dropped to nine in 1928, to four in 1929, and to none in 1930 (production was also considerably curtailed in 1930). In none of the cases in which time was lost had the men taken salt tablets. In fact, we have not had a single case of cramps among the men who have taken salt regularly. It must be recognized at once that the incidence of cramps and of heat exhaustion in Cleveland is relatively low, but in certain localities where great heat and relatively high humidity are common these disorders cause a very serious amount of disability and a considerable curtailment of production.

The question has arisen in our minds many times whether there could be any danger of administering salt in the quantities advised. Theoretically, there may be an occasional patient with renal damage, to whom we should prefer not to give salt in such quantities, but we have very few men with serious renal disease working on jobs in which there is exposure to extremes of heat and muscular exertion. Men with severe degrees of cardiovascular disease should not be allowed on such jobs. We have the salt tablets placed only in mills where we know that the character of the work and the heat predispose to excessive sweating. It seems very unlikely that any harmful effects would result when the men are working and sweating profusely. We have experienced no ill effects of any kind. It has been shown repeatedly by experiments that the blood chloride level of the normal person is very difficult to change by the administration of sodium chloride. When any change takes place, large quantities of salt must be ingested to obtain even a very slight increase, and the effect is transient. We know that in persons whose salt reserve has been depleted, the salt is quickly absorbed. It is almost inconceivable that under such conditions, the effect of salt tablets plus water could be much different from dilute salt solution as such, although this theoretical objection has been raised recently by the editor of the "Queries and Minor Notes" in the *Journal of the American Medical Association*, on the basis that the local effect of concentrated solution would be undesirable (40).

Salt in one form or another is now

being used in a number of industries in the Cleveland district, with apparently satisfactory results. Acting upon the information which we disseminated among the plants of the Aluminum Company of America, a number of diversified industries in the East St. Louis district are also using the method.

Factors Involved in Production of Cramps

The most important factors in the production of cramps are high temperatures surrounding the worker, high humidity, and low air velocity—in other words, the factors which interfere with the loss of body heat. Cramps rarely occur among men working in the open air, regardless of the temperature. The next most important factor seems to be muscular effort. As previously stated, cramps commonly occur in the muscles most vigorously used, and seldom occur on jobs involving little exertion. Another factor of importance is the physical status of the worker. Our observations confirm those of others that the recent ingestion of alcohol, inadequate sleep, inadequate food, and intercurrent disease predispose to development of cramps. Acclimatization is also an important factor. Men who have been continuously employed on the same type of work seem to be able to work and sweat more efficiently than after periods of inactivity. Inexperienced men starting on hard work in the heat are particularly liable to develop cramps. Cramps and heat exhaustion are likely to appear on the first hot day following a cool spell. We have observed no constant racial predisposition to cramps. They are relatively common among negroes, but this is probably due to the fact that many of the hottest jobs are filled by negroes. We have never seen a case of cramps in an obese person; it is the spare, wiry man who is most commonly affected. It is possible that in the process of natural selection, the thin, wiry person finds himself in the most strenuous occupations.

The description of a typical attack of cramps given in the opening paragraphs covers most of the commoner points observed. The cramps may come on after a latent interval, sometimes not appearing until the worker has gone home; frequently they occur after muscular effort following an interval of rest. The body temperature has been elevated only slightly, if at all, in the cases we have observed.

Twenty-five years ago the idea was prevalent in the steel industry that heat cramps were due to the drinking of ice water. In accordance with this theory, many steel mills were planned with elaborate methods of moderating the temperature of the drinking water. There seems to be no sound basis for the ice water theory, although it still has its proponents in the industry. It is possible that furnishing only tepid water for employees would discourage drinking large quantities, and this might be a slight factor in preventing salt loss. The workers were in the habit of taking empirical remedies to prevent cramps, such as oatmeal water, tea, lemonade, cream of tartar, and beer. Coplin comments on the fact that beer drinkers were apparently less subject to heat exhaustion than others (1). Our observations on heavy beer drinkers have been less sanguine.

Summary and Conclusions

A typical case of heat cramps is described.

Clinical and experimental evidence is reviewed and tends to show that the loss of large amounts of salt in the sweat is the chief etiologic factor in the production of cramps.

Some of the physiologic problems involved are discussed.

Heat cramps are readily relieved by the administration of salt solution.

Cramps are prevented by the prophylactic administration of sodium chloride in tablet form.

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ABSTRACT OF THE LITERATURE

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ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

VOLUME XIII JANUARY, 1931 NUMBER 1

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GENERAL

ANNUAL REPORT OF THE SOUTH AFRICAN INSTITUTE FOR MEDICAL RESEARCH FOR THE YEAR ENDED 31ST DECEMBER, 1929. *Johannesburg, 1930, pp. 84.*

The scope of research carried out tends year by year to become wider, while industrial problems occupy a comparatively smaller space. With regard to dust problems, work is in hand with a view to treating silica dust in the mines as "fume" by withdrawing it on the vacuum cleaner principle. An investigation into the incidence of bronchiectasis in relation to silicosis has not so far revealed close correlation between the two conditions. Investigations among men working on asbestos mines disclosed asbestosis bodies in lungs of patients after working for no more than two months; on the other hand, powdered asbestos, subcutaneously injected in animals, gave no such bodies at the end of three months. Apparently some factor necessary for their formation is present in living lungs, but is absent in subcutaneous tissues. No such bodies have ever been detected in silicotic lungs. In two fatal cases from lobar pneumonia among such men, generalized fibrosis, as well as asbestosis bodies, was found. Experiments in which the ears of rabbits were painted with tar showed that

if the painting was resumed after an interval of several months, tumors developed more rapidly than in rabbits painted for the first time. Tar had apparently left the cells in a state of hypersusceptibility to tumor formation.—E. L. C.

TENTH ANNUAL REPORT OF THE INDUSTRIAL HEALTH RESEARCH BOARD (FORMERLY THE INDUSTRIAL FATIGUE RESEARCH BOARD) TO 31ST DECEMBER, 1929. *H. M. Stationery Office, 1930, pp. 29.*

This report is a short one; nevertheless, like its predecessors, it has much interest. The Board has changed secretaries; it has lost Mr. D. R. Wilson, whose services from the foundation of the Board have been so valuable; but it now gains the services of Sir David Munro.

Reference is made to particular problems of wide industrial importance, such as the physiology of heating and ventilation, vision and lighting, noise and vibration, accident causation, sickness records, and other subjects. Glancing over this group of studies, the tendency is apparent for research to be more and more concerned with individual workers than with groups of operatives; thus, suitable spectacles have been found valuable at close work, even for those with normal sight; and the existence of accident proneness in some workers, but not in others, has been demonstrated. Difficulties are reported in carrying out intensive investigations of sickness records, and it is doubtful whether the results obtained up to the present by this approach to industrial problems have given adequate return. On the whole, the principles underlying human activity, revealed by the work of the Board, are of great value and should be adopted in industrial practice, but their widespread acceptance halts, partly for lack of knowledge, and partly for lack of initiative.—E. L. C.

INDUSTRIAL HYGIENE UNDER TROPICAL CONDITIONS. *A. J. H. Russell. Jour. State Med., Sept., 1930, vol. 38, pp. 497–508.*

The author writes from experience gathered in India, where conditions of industrial labor are now under investigation. India is fundamentally an agricultural country. Here and there modern factories have come into existence, but the wage earners, for the most part, continue to return to the land for sowing and reaping every year. The home conditions of the workers, rather than the factory premises, are today at fault, since little housing provision has been made, and overcrowded huts with no sort of sanitary arrangements have to do duty. Further, the food of the workers is lacking in energy values. Up-to-date employers are finding it profitable to establish medical supervision, housing accommodation, and eating facilities. Female labor is an important element, and crèches are provided for the children of nursing mothers. Something has also been done by factory legislation to limit hours of work and the employment of juvenile labor.

Today textile factories account for the majority of industrial labor, and steps are being taken to control atmospheric conditions; but the dominant factors in sickness causation are climatic and living conditions, rather than working environment. Absenteeism is so prevalent that firms often keep

10 per cent. more upon the payroll than is required for tending the machinery. Today occupational diseases occupy a very minor place in the morbidity statistics of industry. Dysentery and diarrhea, malaria and cholera, and malnutrition conditions are the main causes. The evolution of industry in India must tend to give workers a higher standard of living, and to develop a type of medical service needed for improving the working environment.—E. L. C.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

OCCUPATIONAL EPITHELIOMAS. *P. Blum and J. Bralez. Paris méd., Feb. 8, 1930, vol. 20, pp. 125–132.*

This is a brief general review of the subject under the headings: etiology; clinical forms; pathogenesis; pathologic anatomy; treatment; and prophylaxis.—M. C. S.

AURICULAR FLUTTER FOLLOWING DIRECT INJURY TO THE CHEST. *M. H. Kahn. Am. Jour. Med. Sc., May, 1930, vol. 179, pp. 605–609.*

1. A case is reported in which, following direct violence to the chest, auricular flutter was discovered with signs of heart failure.

2. The pathogenesis of this condition is only to be surmised. The possibility of subepicardial ecchymosis in the auricular muscle is to be considered.

3. Milder injuries of the myocardium may result from direct violence to the chest with consequent disability, although consistent with continued life.

4. The blood pressure findings suggest that a definite amount of ventricular filling is produced by each auricular contraction.—*Author's Summary.*

SUCCESSFUL LATE RESULTS FOLLOWING OPERATIVE TREATMENT OF ANILINE TUMORS. *L. Simon. Abstr. as follows from Zentralbl. f. Gewerbehyg., March, 1930, N. S. vol. 7, pp. 78–80, in Bull. Hyg., Aug., 1930, vol. 5, p. 627.*

The author gives statistics of the results of operations for cancer of the bladder: (*a*) of unknown origin; (*b*) in dye workers. The former class shows 21 per cent. of survivals after three years, and 10.5 per cent. after five years; the latter shows 59.7 per cent. of survivals after three years, and 49.3 per cent. after five years. The so-called aniline tumors appear to be much less malignant than other tumors of the bladder. In patients who refused operation the author has seen aniline tumors remain stationary for years, and he has never seen distant metastases from these tumors.—E. L. K.

PULMONARY CANCER AMONG MINERS OF JOACHIMSTAL, CZECHOSLOVAKIA. *A. Pirchan and H. Sikl. Méd. du travail, Sept., 1930, vol. 2, Compt. rend. du Congrès, pp. 338–342.*

Details are given of postmortem findings in three miners who died from cancer of the lung. They were aged 39, 42, and 51 years. In all, four cases occurred during two years among about 400 men; this percentage is very

high. In each case the left side was affected, with a typical small cell epithelioma. The cases resembled those reported among miners at Schneeberg, where analogous minerals are being extracted. The subject is being followed up by examining clinically miners at work and those who have retired.—E. L. C.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

USE OF ETHYL MERCAPTAN TO DETECT LEAKS IN NATURAL-GAS DISTRIBUTION SYSTEMS. *R. R. Sayers, A. C. Fieldner, W. P. Yant, R. D. Leitch, and S. J. Pearce. U. S. Bur. Mines, Rep. Investigations, Serial No. 3007, June, 1930, pp. 13.*

"Leakage surveys of natural gas in which ethyl mercaptan was used to odorize the gas were made at Franklin, Ohio, a city having a population of 4,000, a natural-gas property of 1,050–1,100 meters, and a daily gas sendout at the time of the survey of 100,000 cubic feet; and at Middletown, Ohio, a city having a population of 30,000, a natural-gas property of 7,500 meters, and a daily gas sendout of 890,000 cubic feet. In the survey at each city the entire gas sendout to the distributing system was odorized for several days with comparatively low concentrations at the start, 7.7 to 9.3 pounds of ethyl mercaptan per million cubic feet of gas, for indicating house leaks, and then later increased to high concentrations, 31.0 to 46.5 pounds per million cubic feet of gas, for several days to indicate underground leaks."

"In these leak surveys the use of ethyl mercaptan was entirely successful. It appeared to be far more efficient than and entailed only a fraction of the cost of ordinary inspection methods. A discussion is given of the chemical and physiological properties of ethyl mercaptan, the procedure for conducting ethyl mercaptan surveys, the importance of favorable season and weather conditions, and the concentrations found to be effective."

The authors' conclusions are as follows:

"1. The odorizing of natural gas with ethyl mercaptan was found to be a practical means for detecting leakage and a much cheaper means than usual inspection methods.

"2. Concentrations of 7.7 to 9.3 pounds of ethyl mercaptan per million cubic feet of gas were found very effective in indicating house leaks. It is thought that half that amount or even less would be ample to indicate leaks of significant magnitude.

"3. Concentrations of 31.0 to 46.5 pounds of ethyl mercaptan per million cubic feet of gas were found effective in indicating underground leaks in mains and service lines.

"4. The use of ethyl mercaptan caused no complaints from customers unless leaks were present."—P. D.

POISON IN SHOE INDUSTRY. *C. L. Ferguson. Ohio State Med. Jour., May 1, 1930, vol. 26, p. 410.*

AN ENQUIRY INTO THE HEALTH OF WORKERS IN ARTIFICIAL SILK FACTOR-

IES IN BELGIUM. *Abstr. as follows from Internat. Labour Rev., Dec., 1929, vol. 20, pp. 855–857, in Bull. Hyg., July, 1930, vol. 5, p. 571.*

The inquiry was made to investigate a claim that alcohol-ether poisoning was occurring in Belgian artificial silk factories; 485 men and 840 women were medically examined. A good standard of health was found in each of three factories, with no special morbidity or symptoms of irritation. Some nervous attacks, occurring, however, in no particular department, were ascribed to frequenting cinemas and dancing. Careful analysis of the air breathed for alcohol and ether placed the maximum possible to be absorbed in eight hours at 1 c.c. of ether, and 0.19 c.c. of alcohol. Such amounts are quite innocuous.—E. L. C.

THE USE AND VALUE OF AIR ANALYSES IN ILLINOIS MINES. *A. U. Miller. U. S. Bur. Mines, Rep. Investigations, Serial No. 3043, Oct., 1930, pp. 19 (mimeographed).*

This is an intensely practical treatment of the subject. It includes numerous tables and examples of gas mixtures found in mine air in so-called normal or non-gassy mines and in gassy mines, and data on the composition of air in spaces that are walled off in order to extinguish fires. The paper is not adapted to abstracting.—P. D.

AIR AND MINE GASES. *A. MacEachern. Abstr. as follows from Canadian Min. and Metall. Bull., 1930, no. 218, pp. 787–800, in Chem. Abstr., Nov. 20, 1930, vol. 24, p. 5897.*

The principal mine gases are fire damp (methane), carbon dioxide, black damp (formerly considered the same as carbon dioxide, but now known to be a uniform mixture of carbon dioxide and nitrogen in variable proportions), white damp (carbon monoxide), stink damp (hydrogen sulphide), afterdamp (the gaseous products of a mine explosion, a variable mixture of gases), and nitrous fumes. These are discussed with reference to their occurrence in mines, properties, and physiologic effects in different concentrations. Unlike the surface atmosphere, mine atmosphere is not subject to the natural purification processes of plant life.—P. D.

ACROLEIN AS A WARNING AGENT FOR DETECTING LEAKAGE OF METHYL CHLORIDE FROM REFRIGERATORS. *W. P. Yant, H. H. Schrenk, F. A. Patty, and R. R. Sayers. U. S. Bur. Mines, Rep. Investigations, Serial No. 3027, July, 1930, pp. 11 (mimeographed).*

The following is part of the authors' summary:

"The stability and distribution of acrolein when used as a warning agent for indicating leakage of methyl chloride from unit-type refrigerating appliances were studied by charging the appliances with acrolein-methyl chloride mixtures and making periodic determinations of the acrolein content of the methyl chloride in various parts of the refrigerating system. Warning concentrations of acrolein were determined by exposure of persons to air containing known amounts of acrolein-methyl chloride mixtures."

"Exposure to 1 part of acrolein per million parts of air produces detectable eye and nose irritation in two to three minutes, moderate eye irritation with lacrimation in four minutes, and is painful and practically intolerable in

five minutes. Concentrations of 5.5 parts per million of air cause painful eye and nose irritation in 20 seconds and are practically intolerable in one minute. One part per million is thought to be adequate for giving warning.

"When charged with methyl chloride containing 0.6 to 1.0 per cent of acrolein by volume, the amount of acrolein in the various parts of the commercial units tested was enough to give warning of leakage of liquid from the evaporator or float chamber when the concentration of methyl chloride in the air was 0.0066 to 0.01 per cent by volume, and 0.066 to 0.10 methyl chloride if the leakage was vapor from the remainder of the system. Animal experiments have indicated that repeated daily exposure of several hours to 0.005 to 0.01 per cent does not cause apparent harm and that 0.05 to 0.10 does not cause apparent harm after a single exposure of several hours."—P. D.

ACROLEIN AS A WARNING AGENT FOR DETECTING LEAKAGE OF METHYL CHLORIDE FROM A MULTIPLE REFRIGERATION SYSTEM. *H. H. Schrenk, F. A. Patty, and W. P. Yant. U. S. Bur. Mines, Rep. Investigations, Serial No. 3031, Sept., 1930, pp. 7 (mimeographed).*

From the hygienic standpoint the previous abstract suffices for this paper. Differences between the two are essentially those of mechanics.—P. D.

ELIMINATION OF ARSENIC AFTER SHEEP-DIPPING. *T. Oliver. Lancet, Oct. 4, 1930, vol. 2, p. 740.*

A case is recorded of a shepherd who, on two occasions, was affected by arsenical sheep dip. The first time, a rash occurred from ankles to above the knees, which was associated with diarrhea. Four years later, after dipping, he developed abdominal pain, jaundice, and paresis with mental impairment. Five months later he had recovered; but knee jerks were absent, and arsenic was found in both the urine and the hair. Sheep dips are needed to clear fleece of parasites; carbolic acid and arsenic are the most efficient agents because of their toxic properties. As the hands and forearms of dippers are not protected, dermatitis may occur.—E. L. C.

THE TREATMENT OF WOOL FOR MATTRESSES WITH BARIUM CHLORIDE FROM THE HYGIENIC ASPECT. *E. Bertarelli. Abstr. as follows from Ann. d'ig., Nov., 1929, vol. 39, pp. 813–824, in Bull. Hyg., July, 1930, vol. 5, p. 573.*

This article is full of interest. The problem is a two-sided one, the commercial and the more strictly hygienic. From the commercial point of view, treatment by barium chloride is carried out to make the wool more elastic, drier, more durable, and whiter. From the public health aspect, the question is whether the barium has a detrimental effect on the washers, carders, or others handling the products. These are in general terms the chief points to consider. In more detail, the barium chloride, in addition to what is stated above, prevents attack by moth and other insects, removes moisture and renders the wool less hygroscopic, enhances its keeping properties, and increases the aesthetic value by its whiteness.

Nontreated wool must not contain

above 17 per cent. of moisture and the average of several samples tested worked out at 15 per cent.; those treated had only from 6.3 to 8 per cent. Other analyses showed that so-called "pure wool" was only 80 per cent. pure, after deducting moisture, grease, and extraneous matter, whereas the treated product contained 81.8 per cent.; in other words, the amount of pure wool is greater in the treated. Again, the treated is less hygroscopic. Experiment showed that pure untreated wool with an initial humidity of 10.5, after forty-eight hours contained 13.8 per cent. moisture, whereas the treated with an initial of 5.5 contained only 6.2 per cent. after the same interval. Finally, the treated was found to withstand better the process of steam disinfection.

From the hygienic aspect, careful experiments led to the conclusion that, even with prolonged carding of treated wool, in no instance was sufficient barium salt inhaled to cause toxic symptoms or even suspicion of them, and the author fairly sums up the position by stating that as carried out the treatment presents no danger or inconvenience either to those who prepare the wool or to those who card it.—H. H. S.

CARBON DISULPHIDE POISONING. *F. Holmsen. Abstr. as follows from Acta med. Scandinav., Suppl. 34, 1929, pp. 164–169, in Chem. Abstr., Nov. 10, 1930, vol. 24, p. 5380.*

A description is given of the symptoms of carbon disulphide poisoning as they appear in the nervous system, skin, blood, etc.—P. D.

THE RESPONSE OF JAPANESE WALTZING MICE AND CANARIES TO CARBON MONOXIDE AND TO ATMOSPHERES DEFICIENT IN OXYGEN. *W. P. Yant, F. A. Patty, H. H. Schrenk, and L. B. Berger. U. S. Bur. Mines, Rep. Investigations, Serial No. 3040, Oct., 1930, pp. 12 (mimeographed).*

The response of Japanese waltzing mice to carbon monoxide and to atmospheres deficient in oxygen was determined, and a comparison made with the response of canaries. Because of their almost incessant activity, it was thought that the waltzing mice would respond more quickly than canaries and ordinary white mice to carbon monoxide and possibly atmospheres deficient in oxygen, and thus be more satisfactory than the latter animals for detecting air contamination that is harmful to man. A comparison of the response of these animals was made and the results correlated with the response of man.

1. Japanese waltzing mice appear to be as sensitive as canaries in concentrations of 0.2 to 0.24 per cent. carbon monoxide in air by volume and more sensitive than canaries in concentrations of 0.14 to 0.16 per cent. Both canaries of average susceptibility and waltzing mice, however, will give indications of carbon monoxide in advance of marked discomfort and serious harm to man when concentrations are within this range and when the activity of man does not exceed the equivalent of walking. Waltzing mice exposed to 0.1 to 0.12 per cent. carbon monoxide gave positive indication of carbon monoxide after five to ten minutes' exposure, whereas the canaries generally failed to give indication

after seventy-five to 131 minutes. Canaries are thus unsatisfactory for giving warning in this lower range of concentrations, because man could acquire a very discomforting and perhaps harmful degree of poisoning before observable symptoms occurred in the birds. In concentrations appreciably above 0.25 per cent., the margin of time is narrow between the undesirable response of men doing moderate to strenuous work and observable response of either canaries or waltzing mice.

2. The markedly high individual tolerance that is occasionally found among canaries, and which may result in serious poisoning in men if these tolerant subjects are used for giving indications of harmful atmospheres, was not found among the ten specimens of waltzing mice which were under observation.

3. The sensitivity of ordinary white mice, canaries, and waltzing mice to concentrations of carbon monoxide ranging from 0.1 to 0.25 per cent., increases in the order named.

4. Although waltzing mice appear to be slightly more sensitive to atmospheres deficient in oxygen than canaries and the latter slightly more sensitive than man, the margin of time between serious response of man and observable response of these animals is not wide enough for either canaries or waltzing mice to be of practical use for avoiding harmful exposure of man.—*Authors' Summary and Conclusions.*

DETERMINATION OF TRACES OF CARBON MONOXIDE IN ATMOSPHERIC AIR. *M. B. Zapadinskii and S. V. Leonov. Abstr. as follows from Jour. Chem. Industry (Russia), 1929, vol. 6, pp. 1273–1274, in Chem. Abstr., July 20, 1930, vol. 24, p. 3459.*

The method is based on oxidizing carbon monoxide to carbon dioxide by means of cupric oxide in a furnace and collecting the carbon dioxide in barium hydroxide solution.—P. D.

DETECTION OF CARBON MONOXIDE IN QUANTITIES INJURIOUS TO HEALTH. *G. Ljunggren. Abstr. as follows from Skandinav. Arch. f. Physiol., 1928, vol. 55, p. 277, in Chem. Abstr., July 20, 1930, vol. 24, p. 3459.*

A palladium chloride test paper impregnated with sodium acetate and moistened with one drop of water quickly detects carbon monoxide in the air even in a concentration of 0.2 volume per cent., which is fatal only when such air is breathed for one hour. Even as little as 0.01 volume per cent. of carbon monoxide will give a positive result, but this requires twenty minutes.—P. D.

TESTS OF AMPOULES FILLED WITH PALLADIUM SALT SOLUTION FOR DETECTING CARBON MONOXIDE. *L. B. Berger and W. P. Yant. U. S. Bur. Mines, Rep. Investigations, Serial No. 3030, Sept., 1930, pp. 9 (mimeographed).*

"The ampoule [U. S. Patent 1,644,014] is a cotton-covered thin-walled glass tube (approximately $1\frac{1}{2}$ inches long and $\frac{3}{16}$ inch in diameter) filled with a solution of palladium chloride in a water-acetone mixture and hermetically sealed. In some designs the cotton covering is enclosed in a web or net of cotton thread; in others the cotton is held in place by girth-like bindings of thread. The appearance of the product is very similar to the ampoules of aromatic

spirits of ammonia or amyl nitrite used for administering inhalation treatments of these products.

"Briefly, the procedure for using the detector is to crush the ampoule, which in turn wets the cotton-covering with the palladium solution, and then expose it to the air to be tested."

Part of the authors' summary is as follows:

"When the temperature of the air is above 50°F., or 10°C., the detector gives semiquantitative indications of CO in a range of concentrations of 2 to 10 parts in 10,000 parts of air by volume. Higher concentrations are qualitatively indicated to be above 10 parts in 10,000 of air.

"The sensitivity of the detector was found to decrease with low air temperatures. A longer period of exposure than the prescribed 10 minutes was required to give a satisfactory indication of the amount of carbon monoxide. For temperatures of 50 and 32°F., a period of 20 to 30 minutes was required, and at 0°F. the reaction was retarded to an extent that satisfactory indication was not produced by 30 minutes exposure of the ampoule."

"It was found that gasoline vapor, ethylene, hydrogen, and hydrogen sulphide produced a change in the color of the ampoules similar to that caused by CO. Concentrations of these gases which produced the change, however, were also dangerous because of a hazard of either poisoning or explosion."—P. D.

DEMONSTRATION OF CARBON MONOXIDE IN THE EXHUMED CADAVER. *F. Wiethold. Abstr. as follows from Deutsch. Ztschr. f. d. ges. gerichtl. Med., 1929, vol. 14, pp. 135–138, in Chem. Abstr., Oct. 10, 1930, vol. 24, p. 4796.*

Carbon monoxide was found in the blood in the corpse of a man 122 days after death by carbon monoxide poisoning. In the cases of two children, carbon monoxide was found in the blood twenty-five and forty hours, respectively, after death. Detection of carbon monoxide was made spectroscopically.—P. D.

CARBON MONOXIDE POISONING IN INDUSTRY. *M. R. Mayers. N. Y. State Dept. Labor, Bur. Indust. Hyg. Bull., 1930, pp. 243.*

This bulletin is a carefully prepared statement in regard to the practical phases of carbon monoxide poisoning. It includes a fairly thorough recent bibliography—again one which emphasizes the practical phases of the carbon monoxide problem. No industry with a carbon monoxide hazard should neglect obtaining the bulletin.—C. K. D.

REVIEW OF CARBON MONOXIDE POISONING. *R. R. Sayers and S. J. Davenport. U. S. Pub. Health Bull. No. 195, 1930, pp. 97.*

This is a brief general summary of the carbon monoxide problem. Industrial physicians and engineers confronted with a carbon monoxide hazard should secure this review which, together with the New York bulletin, gives a very creditable survey of the entire field.—C. K. D.

THE EFFECT OF CARBON MONOXIDE ON THE NERVOUS SYSTEM. *Z. Swetnik. Abstr. as follows from Monatschr. f. Psychiat. u. Neurol., Nov., 1929, vol. 74, p. 71, in Arch. Neurol. and Psychiat., Nov., 1930, vol. 24, p. 1052.*

In this article the pathologic observations in a case of carbon monoxide poisoning are described. Clinically, there were signs of general rigidity, and death occurred nine days after accidental exposure to the gas. In the cerebellum, the Purkinje cells were severely degenerated and somewhat thinned out. Many of the cells of the dentate nucleus also showed marked degenerative changes. In the red nucleus, caudate nucleus, and putamen the cells were affected to a lesser extent. There were bilateral pallidal softenings in the stage of connective tissue and gliogenous organization. The blood vessels were very hyperemic in all regions except the dentate nucleus. Occasional small extravasations of blood were found in the pallidum, putamen, and red nucleus. No definite changes were observed in the nerve cells of the cortex. As the lesions of the nerve tissues did not exhibit any apparent relationship to the vascular changes, the author rejects the theory that attempts to explain all the changes on the basis of primary vascular involvement. After summarizing the literature on carbon monoxide poisoning, he concludes that the pathologic changes in the central nervous system are of two types, focal and diffuse. He explains the coexistence of two kinds of lesions by resorting to the hypothesis that different parts of the nervous system are more sensitive than others by reason of their differing chemical structure. The fact that a focal lesion may occur in one case but fail to appear in the same region in other cases is thought to be due to such circumstances as the concentration of the gas, the duration of exposure, and the individual characteristics of the organism. The author believes that in his case, at any rate, the changes in the nerve tissue were probably caused by the direct action of the carbon monoxide. He is, however, unable to exclude the possibility that the lesions may be produced by the effects of asphyxia or by a combination of these two factors. Hyperemia and stasis are regarded as probable accessory factors.

ACUTE RESPONSE OF GUINEA PIGS TO VAPORS OF SOME NEW COMMERCIAL ORGANIC COMPOUNDS. VI. DIOXAN. *W. P. Yant, H. H. Schrenk, C. P. Waite, and F. A. Patty. U. S. Pub. Health Rep., Aug. 29, 1930, vol. 45, pp. 2023–2032 (Reprint No. 1407).*

The acute physiologic response of guinea-pigs to air containing dioxan vapor was determined. The concentration of vapor and periods of exposure ranged from those which produced death to those which caused no apparent effect after several hours' exposure. The symptoms, gross pathology, and fatality are given, with a discussion of potential hazards.

1. The symptoms are principally those of eye and nasal irritation, with signs of lung irritation after long exposure, and narcosis with high concentration.

2. The principal gross pathologic findings were congestion and edema of the lungs and hyperemia of the brain.

3. Because of the comparatively low vapor pressure of dioxan it is not possible to attain concentrations in air at 20°C. which will kill guinea-pigs in less than two to three hours' exposure. Concentrations of 1 per cent. did not cause death after eight hours' exposure.

4. Dioxan vapor possesses warning properties manifested as eye, nose, and throat irritation. Persons exposed to 0.16 per cent. in air by volume immediately experienced a slight irritation of the eyes and nose, with lacrimation. Exposure to 0.55 per cent. produced a marked and discomforting degree of the same symptoms with the addition of a burning sensation in the throat.

5. Considering the comparatively low toxicity of dioxan vapor and the warning intensity of concentrations below those which produced serious harm to guinea-pigs, it appears that health hazards from breathing the vapors are slight under ordinary conditions of usage and reasonable exposure. As in the case of practically all comparatively nontoxic volatile liquids, however, dioxan presents a hazard to life under conditions of exposure to air confined over the liquid in tanks, vats, and similar places where high concentrations would accumulate.—*Authors' Summary.*

DUST HAZARDS AND THEIR EFFECTS

INDUSTRIAL PNEUMONOKONIOSES. *Beihefte z. Zentralbl. f. Gewerbehyg., 1929, no. 15, pp. 146.*

This publication contains nine lectures given at a meeting of industrial physicians in Bochum, Germany, May 4 to 7, 1929.

Industrial Dust and its Control by Legal Regulations, Particularly in Foreign Countries. W. Schürmann. Pp. 1–21.

The author traces the history of the dust problem from the time of the ancient Greek and Roman writers up to the present day. He discusses different trades, particularly with regard to dust production and the health hazard. Tables and statistics are given to illustrate the dust concentrations and incidence of pulmonary diseases as well as mortality statistics. Ventilation systems and other preventive measures, such as periodic physical examination of the workers, are briefly discussed. In conclusion, the author reviews the present legislation in various countries for prevention and compensation of pulmonary diseases in dusty trades. A list of references is appended.

Pneumonokoniosis and Tuberculosis in Dusted Lungs. K. W. Jötten. Pp. 22–49.

Part 1.—The author points out the danger of the different kinds of dusts and expresses the opinion that the free silica content is responsible for their action on the lung tissues and the production of fibrosis. If lime is present in a dust mixture, the effect of the silica is lessened. He discusses the physical properties of dust and agrees with the conception of American authors that dust particles less than 10 microns in size are far more dangerous than those of larger dimensions. The present methods for taking dust samples in factories, etc., and their respective advantages and disadvantages are briefly discussed. The effect on the organism of dusts of different chemical compositions is mentioned. The por-

celain industry is considered as dangerous to workers, in proportion to the concentration of free silica in the air. Metal grinding is hazardous to workmen chiefly because of the material of which the grinding wheels are made. American observations show that an artificial grinding wheel is less dangerous, since the material of which it is composed is not so highly dust producing as natural stone. The author believes that metal dust will produce a fibrosis only when it is contaminated with silica. The same is true for coal, which in itself merely causes pigmentation, but if mixed with rock dust is likely to give the picture of the so called "coal miners' lung." According to his opinion, all the other organic substances follow the same rule, and give rise to indurative processes only when they contain silica. He believes that tobacco dust does not produce fibrosis, but does produce superficial lesions in the epithelium, which offer fertile soil for tuberculous infection.

Part 2.—This part deals with the relation between dusty trades and pulmonary tuberculosis. There is a high incidence of tuberculosis among steel grinders and miners. In the stone cutting industries, the people working with sandstone are exposed to a greater hazard than are those working with granite, which has a lower crystalline silica content. Marble dust is considered as the least dangerous dust. All these differences are due to the higher or the lower content of free silica. Workers in factories with organic dusts, such as those of wool, cotton, tobacco, and wood, have a very high incidence of tuberculosis, which might be explained by the epithelial lesions caused by these substances, and subsequent infection with the tubercle bacillus. On the other hand, there are certain industries in which tuberculosis rarely occurs, as in lime, plaster, or cement factories. Porcelain, as has already been said, is dangerous because of its silica content. Coal miners, when dealing with coal only and not with the drilling or breaking of the stone, are in relatively little danger of tuberculosis in spite of the fact that they inhale a rather large amount of dust continually. This is true especially for English coal miners, who have a distinctly lower mortality rate from tuberculosis than all other English workmen. The tuberculosis cases among workers in tobacco factories are probably due not to a "tobaccosis," but to the rather poor economic conditions of the workers. There is, of course, in such factories the possibility of tuberculous infection being transferred, by means of the dust, from an infected person to a healthy one working in the same room. Similar conditions occur in textile mills.

Jötten describes his experiments on rabbits which were exposed to different kinds of industrial dust and which became infected with tuberculosis during the course of the experiment. Rabbits were also used which were infected before the experiment started so that the influence of dusting on the development of the disease could be studied. He discovered that dusts containing free silica were much more harmful than others. Calcium hydroxide seemed to be the least dangerous.

The Pathologic Anatomy of the Dusted Lung. H. Schridde. P. 50.

The author points out that from an

anatomic point of view there exist three different kinds of dusted lungs in coal miners: (1) the soot lung; (2) the coal dust lung; (3) the stone dust lung (silicosis), which is usually associated with (1) and (2). For the development of stone dust lung a special predisposition of the connective tissue is necessary. This same predisposition in the skin gives rise to keloid formation. He differentiates between keloidosis nodosa and keloidosis diffusa. Details on this can be found in *Klinische Wochenschrift*, 1928, vol. 7, p. 582.

The Clinical Symptoms of the Dusted Lung. von Döhren. Pp. 51–63.

The pathologic anatomic alterations in the dusted lung consist in a fibrosis and, as we now know, this type of change in the lung is produced only by silica dust. All other conditions are merely pigmentations and of little importance. Sometimes silicosis is the only finding in a dusted lung, but in many cases a secondary infection with tuberculosis takes place, which gives rise to almost all the important symptoms and later is responsible for death. The time necessary for the development of pneumonokoniosis varies according to the individual. In most cases there are very few signs during the first five years of work. The percentage of persons affected, however, increases rapidly with the duration of work, reaching nearly 65 per cent. in laborers engaged in the work for from twenty-five to thirty years.

We know that particles larger than 10 microns cannot enter the alveoli. Whether or not physical properties play an important rôle is still a question. We know also that pneumonokoniosis can be produced only by dust containing silica, and that organic dust can never cause such a disease unless it is mixed with silica.

The particles entering the bronchi and bronchioles are taken up by the lymph stream and deposited in the lymph nodes under the pleura and between the alveoli, as well as in the bronchial lymph nodes. Proliferation of the connective tissue sets in, which leads to the formation of nodules and strands; these run together and form thick indurations and adhesions. The lung tissue is compressed and emphysema in the other parts of the lungs is the result. Owing to the increased resistance in circulation, dilatation of the right side of the heart is brought about. These are briefly the pathologic signs of the dusted lung.

Among the subjective symptoms are cough, dyspnea, and pains in the chest and back. These symptoms, however, have no specific significance for diagnosis. Still less characteristic are the physical findings. In advanced cases an important symptom is cardiac insufficiency which leads to the death of the patient. Urinalysis and the blood picture show nothing significant; there is no increase in the blood sedimentation rate.

The most important diagnostic help is the X-ray picture which shows typical alterations in the structure of the lungs. Three stages of the disease can be distinguished according to the degree of severity. In the last stage the differential diagnosis between pneumonokoniosis and tuberculosis is at times very difficult.

There is no therapy and all that can be done to control the disease is to

shift workers who show the first symptoms of pneumonokoniosis to a position in which there is no dust hazard. Regular physical examinations, such as are given in the mines of South Africa, would do much toward the control of the disease.

The Legal Establishment of Stone Dust Disease. V. Reichmann. Pp. 64–72.

The author believes that other dusts besides silica can produce light forms of dusted lungs, *e.g.*, flour dust in bakeries.

In the interpretation of the present legal regulation in Germany, a "severe" case of dusted lung consists in distinct and severe signs of the disease, such as dyspnea, pleural irritation, frequent catarrh, and finally, circulatory disturbances.

Since it is very difficult for ordinary physicians to make an exact diagnosis in a case of silicosis, the diagnosis for compensation purposes should be made by experts only. In compensating the disease not only disability for stone work but also disability for work in general must be considered; these two forms of incapacity do not necessarily run parallel. The law also provides compensation for tuberculosis associated with severe cases of dusted lung. Differentiation between these two conditions is difficult, and it requires an expert physician to make a fair decision. Complications other than tuberculosis are not very frequent, probably because of the fact that only persons with perfect health enter the stonecutting industry.

The Pneumonokoniosis of Sandstone, Silica Chalk, Porcelain, Granite, Cement, and Shell Lime Workers. K. Kaestle. Pp. 73–107.

Kaestle presents a large number of clinical and X-ray observations on workers who were still fit for their work when the examinations were made. He discusses his findings extensively, especially the possibility of differential diagnosis between pneumonokoniosis and pulmonary tuberculosis.

Has the Practice of Rock Dusting, Which Is Compulsory in the Coal Mines of the Rhineland-Westphalian District for the Prevention of Fire Damp and Coal Dust Explosions, Any Deleterious Influence on the Health of the Miners? G. Schulte. Pp. 108–119.

The author discusses the historical development of rock dusting for the prevention of explosions, a method which was originated in England and later on adopted by French mines, and which has been compulsory in German coal mines since 1926. To be used for this purpose, a dust has to pass rigid physical, chemical, and microscopic examinations. Special attention is paid to the properties which may possibly be harmful to the health of the workers. In spite of the fact that the silica content is sometimes rather high, no harmful effect on the lungs of miners or laborers in mills producing this dust has yet been observed. Nevertheless, regular physical examinations of the workers are still being made in order to detect any harmful effect which may possibly appear after longer exposure.

Dusted Lungs and Tuberculosis. A. Böhme. Pp. 120–127.

The author shows that higher degrees of change in the anatomic struc-

ture of dusted lungs correspond to a larger amount of silica chemically found to be deposited in that tissue. In regard to the tuberculous infection of dusted lungs, there exist at the present time two opinions: (1) that all the mild and severe changes in the anatomic structure are due to tuberculosis; and (2) that very severe destruction of lung tissue can be brought about by silica alone. There is, however, in most of the well-advanced cases of dusted lung a combination of both these factors. Autopsies on a large number of cases, as well as animal experiments, lead the author to accept the latter opinion.

In regard to the differential diagnosis between tuberculosis and silicosis, the author points out that in cases of tuberculosis the X-ray picture shows changes as being mostly asymmetrical, whereas dusted lungs are more symmetrically spotted. In well-advanced cases, however, this difference seems to disappear. Miliary tuberculosis may present a picture which is similar to that of silicosis but the presence of fever in the former will help in the differential diagnosis. Similar difficulties of differential diagnosis exist also in the clinical examination, especially if the tuberculosis is not an open case and does not produce typical fever reactions.

The mortality rate from tuberculosis among workers with dusted lungs seems to be distinctly higher and the age at which death occurs lower than among other workers. Coal miners perhaps form an exception to this rule, but on the other hand, it was not possible to prove that coal dust has a healthful influence on tuberculosis, as is sometimes asserted.

Grinders' Disease and Pulmonary Tuberculosis. Hollmann. Pp. 128–141.

The author compares the conditions among the steel grinders in Solingen thirty years ago with the present contions, which show that there is no longer any great danger of lung disease, especially of tuberculosis, among these workers. The ventilation is much better in the modern plant, and the social and housing conditions of the workers have greatly improved. A tuberculosis clinic is doing the work of physical examination, with nurses following up cases and contacts. To prevent pneumonokoniosis, periodic X-ray examinations are advisable, preferably at intervals of two to three years.—W. O. K.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

Disinfection of Skins Charged with Anthrax. *G. Brotzu. Méd. du travail, July, 1930, pp. 262–269.*

Experiments were carried out in the laboratory with emulsions of anthrax spread on filter paper, dry or damp, and with skins from guinea-pigs, rabbits, or goats that had been killed with anthrax. Fifty different strains of anthrax were used. Thorough disinfection was not obtained with sodium sulphide in proportions which did not damage the skins. The addition of 2 per cent. of potassium arsenite or

arsenic trisulphide, or potassium sulphate or sulphocyanate, or 10 per cent. sodium chloride, gave better results. Only a few resistant bacilli of doubtful infective potency survived; the skins were not harmed. The process has not yet been tried industrially.—E. L. C.

PRIMARY ASPERGILLOSIS OF THE LUNGS. *L. V. Schneider. Am. Rev. Tuberc., Sept., 1930, vol. 22, pp. 267–270.*

1. *Aspergillus fumigatus* is a micro-organism which produces pulmonary lesions resembling those of fibroid tuberculosis.

2. Clinical symptoms and X-ray findings are identical with those of chronic pulmonary tuberculosis; it is therefore likely that some of the cases are overlooked.

3. Differential diagnosis becomes particularly difficult when aspergillus infection is secondary to any respiratory infection.

4. Aspergillus infection is transmitted from pigeons and parrots and is also observed in hair combers who use rye flour to remove grease from the hair; therefore, occupation and a careful history is of importance, as this helps to arrive at a correct diagnosis.

5. Animals inoculated with spores from a pure culture of *Aspergillus fumigatus* showed typical tuberculous lesions at autopsy.

6. Tuberculin tests are of no diagnostic value because aspergillosis gives the same local reaction as tuberculosis.

7. Iodine salts seem to be specifically destructive to the life and growth of the aspergillus fungus.—*Author's Summary.*

BRUCELLOSIS. I. THE SIGNIFICANCE OF BRUCELLA AGGLUTININS IN THE BLOOD OF VETERINARIANS. *I. F. Huddleson and H. W. Johnson. Jour. Am. Med. Assn., June 14, 1930, vol. 94, pp. 1905–1907.*

Of the blood specimens of forty-nine practising veterinarians examined for agglutinins of *Brucella abortus* Bang, 57 per cent. showed agglutinins and 26 per cent. showed agglutinins in dilution (1:100 and above) that is generally accepted as indicating active infection. Only three of the subjects, however, gave a past history of a symptom-complex characteristic of undulant fever. From this and other evidence, the authors conclude that *Brucella abortus* Bang has invasive properties for human beings but that the pathogenicity of the germ is low.

The erythema occurring on the forearms of veterinarians after contact with the vaginas of certain cows, particularly those that have aborted, Huddleson and Johnson propose to designate as "erythema brucellum," and ascribe to hypersensitiveness to *Brucella abortus* protein.—K. R. D.

THE CONNECTION BETWEEN INDUSTRY AND TUBERCULOSIS. *Office internat. d'hyg. pub., Bull. mensuel, June, 1930, vol. 22, pp. 1118–1129.*

The inquiry reported is the first of a series to be carried out by the Red Cross League. It was made at the Pirelli rubber factories in Milan. Methods of procedure rather than results obtained are of interest. Information was collected respecting 1,012 working women, regarding dietary, clothing and cleanliness, the en-

vironment of work, home conditions, domestic duties, recreation, married state, means of transport, and lastly, general health by careful medical examination. Signs of lung trouble, old or active, were detected in 15 per cent., the age distribution of whom resembled that of the total. Only one case of open tuberculosis was detected; and no evidence was forthcoming that the industry exerted any bad influence on health, not even when the processes gave rise to benzol vapor or talc dust. The factories, however, are modern and are conducted with every regard to the workers' well-being.—E. L. C.

ANTHRACOSIS AND TUBERCULOSIS. *H. Schulte-Tigges. Abstr. as follows from Ztschr. f. Tuberk., 1928, vol. 52, p. 290, in Am. Rev. Tuberc., Sept., 1930, vol. 22, p. 68.*

The problem of anthracosis and tuberculosis was studied on a large group of coal miners, utilizing Besredka's complement fixation test, the sedimentation reaction, and roentgenographs. The Besredka reaction was positive in 20 per cent. of the roentgen stage I cases and in 60 per cent. of the stage II cases. The author believes that the tubercle bacillus plays an important rôle in cases of anthracosis.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

ON THE CHANGES IN THE AUDITORY APPARATUS OF WHITE MICE CAUSED BY NOISES IN THE METAL TRADES: PRELIMINARY REPORT FROM THE ALL RUSSIAN CONGRESS OF OTO-LARYNGOLOGISTS HELD AT MOSCOW IN 1927. *N. F. Popoff. Abstr. as follows from Zentralbl. f. Gewerbehyg., April, 1929, N. S. vol. 6, p. 104, in Bull. Hyg., July, 1930, vol. 5, p. 574.*

Popoff put to the test, under factory conditions, the view of Professor Wittmaack that loud noises transmitted to the auditory apparatus through the bones are the cause of ultimate deafness and not the vibrations transmitted through the air and external auditory meatus. This view is confirmed in this preliminary communication.

A wire cage containing ten mice was placed on a stand on the ground (to test combined air transmission and transmission through the body) and another similar cage was suspended by a spring (air transmission). The noise to which the mice were exposed (for weeks and months) was that created by heavy hammers flattening out white-hot steel bars into scythes. The noise was graphically registered as to the prevalence of low tones (60 to 100 vibrations per second) and high tones (2,000 to 3,000). The number of strokes of the hammer per minute was 200. White mice exposed for eight hours daily for twenty days in the cage on the stand showed destructive changes at the commencement of the basilar membrane, the organs of Corti were destroyed, and changes were present in the neighboring ganglion cells. After three months' exposure the destructive process had extended to the higher windings of the cochlea. Here there was destruction of the ganglion cells with their afferent and efferent fibers inside the lamina spiralis and the corresponding portion of the modiolus. After eight to nine months the whole of the ganglion cells and nerve fibers of the upper convolutions had disappeared. No changes were

found under similar examination in the mice in the suspended cage.—T. M. L.

THEORETICAL AND EXPERIMENTAL GROUNDWORK REGARDING THE PROTECTION OF EARS AGAINST NOISE. *A. Peyser. Abstr. as follows from Deutsch. med. Wchnschr., Jan. 24, 1930, vol. 56, pp. 150–151; Jan. 31, 1930, pp. 191–193, in Bull. Hyg., Aug., 1930, vol. 5, pp. 663–664.*

The protection of the ears of workers employed on noisy work is a matter partly for technical experts and partly for medical men. Much can be done by deadening noises. The usual tests of the hearing of apprentices before commencing work are not satisfactory, and there should be instead a functional test of the sensitiveness of the auditory nerve with reference to fatigue. The author has therefore adopted the following test. A tuning fork is used which is fitted with a light hammer, so that the period of resonance is always approximately the same, *viz.*, 200 to 210 seconds. The fork having been struck is held near the ear and the time taken with a stop watch till the person hears nothing; the fork is then removed for two seconds and again brought back to the ear, when in the normal ear it will be heard again for a few seconds, having recovered from fatigue during the two seconds' rest. With ears which are easily fatigued the sound may fail to be heard at 120 seconds and after the two seconds' rest may only be heard up to about 160 seconds, whereas with the normal ear it may fail at 200 and after the two seconds' rest be heard up to from 205 to 210 seconds. Another test takes place in a small room where the person to be tested is exposed to the noise of a metal clapping machine for thirty minutes and a test of the hearing is made ten minutes after stopping the apparatus: the result is then compared with that obtained before exposure to the noise.

It is questionable whether otitis media acts as a protection against noises or whether the condition is aggravated by noises, and there is need of observations on a large number of cases to determine this. The most effective protection of the ears from noises is obtained by the use of soft wax plugs with which are incorporated some fine threads. Such plugs are of particular use against high-pitched noises which are especially injurious. Vibration from the floor can be guarded against by the use of thick soles of soft material or by covering the floor with such material—A. J. C.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

PHYSIOLOGIC VARIATIONS UNDER INDUSTRIAL CONDITIONS. *J. G. Gelmann. Abstr. as follows from Zentralbl. f. Gewerbehyg., May, 1929, N. S. vol. 6, pp. 138–148; June, 1929, pp. 161–168; July, 1929, pp. 207–212; Aug., 1929, pp. 232–238, in Bull. Hyg., July, 1930, vol. 5, p. 576.*

In the first part of this paper the author studies the effects of various

conditions of work upon the pulse rate and blood pressure. His plan was to investigate groups of from five to ten workers for periods of from three to ten days, and he publishes a number of representative graphs. In those engaged in heavy work, particularly at high temperatures, the pulse or blood pressure graph tends to be characterized by abrupt elevations and depressions. Examples are given of the effects of alcohol or heart disease. The frequency of heart disease in various occupations is discussed and the conclusion is reached that there is an association between heavy work at high temperatures and disease of the cardiovascular system. The author next discusses the metabolism of water and salts; a few metabolism experiments are described and there is an extensive tabulation of the average intake of fluid and output of urine in various occupations, as well as a study of changes in body weight and in the excretion of chlorides. There follows a discussion of the frequency of enlargement of the liver in different occupations and some detailed observations of gastric acidity in three kiln workers: (*a*) at rest; (*b*) at work under a temperature of 82° to 94°F.; (*c*) at rest but under the high temperature. (These observations were made by Schewel-juchin who investigated forty-five subjects.) Finally, there is a general discussion of disturbances of the secreto-motor functions of the stomach in workers under high temperatures.—M. G.

PHYSIOLOGIC RESPIRATORY OBSERVATIONS ON THE USE OF INDUSTRIAL GAS MASKS. III. THE SIGNIFICANCE OF THE GAS MASK IN THE OXYGEN CONSUMPTION OF THE WEARER. *Thiel and Quednau. Abstr. as follows from Ztschr. f. d. ges. exper. Med., 1929, vol. 65, pp. 604–620, in Ber. ü. d. ges. Physiol. u. exper. Pharmakol., Nov. 20, 1929, vol. 51, p. 738.*

A mask from the Auer works, with a dead space of 120 to 200 c.c., was the basis of this experimental research. The experimental subjects had to perform, with and without masks, very strenuous but not exhausting work. The duration of the work in each experiment was two minutes and forty seconds. The dead space of the mask caused an increase in the depth of breaths and a decrease in the frequency. The filter alone caused an increase in the depth of breathing which exceeded that produced by the dead space. The whole mask, that is, the combined effects of the dead space and the filter, produced a somewhat greater increase in the minute-volume than did each part separately. In the authors' opinion, the modern pendulum mask offers little hindrance to the efficiency of the wearer, at least in the case of a trained subject and with an unused filter. The oxygen requirement for heavy work can also be taken care of by the mask. Oxygen debt does not appear any earlier than it would otherwise. The increase in use of oxygen as a result of wearing the mask corresponds to the increase in effort spent in breathing and in frequency of breaths. The increase in minute-volume exceeds by far the increase required to meet the increased demand for oxygen. Slow breathers accomplish the most economical breathing.

INDUSTRIAL ENVIRONMENTAL CONDITIONS

SOME SPECIAL PROBLEMS IN ATMOSPHERIC POLLUTION. *A. Wolman. Am. Jour. Pub. Health, March, 1930, vol. 20, pp. 243–251.*

Wolman cites as illustrative of the problems which have confronted the Maryland State Department of Health the carbon monoxide hazards in the steel industry, benzol poisoning in the steel industry, hydrogen sulphide in the illuminating gas industry, and phosphorus poisoning in the manufacture of fireworks. He describes in some detail the conditions in the steel industry and in the illuminating gas industry which were responsible for atmospheric pollution and tells what was done to improve them. It is his opinion that the disabilities inherent in these examples of atmospheric pollution result largely from the ignorance and inertia of both employer and employee, and that there is need not only of official health department control over such hazards, but also of educating employer and worker alike in the potentialities and methods of avoidance of danger.

THE CONTROL OF CONDENSATION. *J. H. Vogt. Abstr. as follows from N. Y. State Dept. Labor, Indust. Hyg. Bull., June, 1930, vol. 6, pp. 41–42, in Bull. Hyg., Oct., 1930, vol. 5, p. 753.*

Condensation of moisture is frequently troublesome in factories, such as dye works; the materials under manipulation may be damaged by drippings or the resulting fog may, by obscuring the view, be a source of danger. Condensation may be avoided by preventing steam from escaping into the air by carefully stopping all leaky joints, or by catching it as it rises from a vat in an aspirating current which conveys it outside; or the fog may be cleared by introducing a sufficient volume of hot dry air. Each instance calls for separate treatment.—E. L. C.

CLIMATE AND WORK: PART I. *W. Strauss. Arch. f. Gewerbepath. u. Gewerbehyg., Feb. 14, 1930, vol. 1, nos. 1 and 2, pp. 203–239.*

To the long list of critical reviews of the literature on the kata-thermometer and effective temperature indexes, Strauss adds another lengthy article without offering anything new or any constructive criticism.

After criticizing the two methods in common use for ascertaining the thermal condition of the atmosphere and its probable effects on human beings, the author presents some experimental data which pave the way for the revival of an old notion, namely, the graduation of atmospheric conditions in industries according to the fatigue produced on the workers. He points out with pride that in his measurements of fatigue the time of recovery as measured by the respiratory gas exchange bears a definite relation to the atmospheric conditions.

From the fundamental point of view this is quite interesting. Actually, however, owing to many complex causes, the individual variations in the time of recovery are so great, as shown in the author's data, that little practical information is to be gained by resorting to such a laborious method, which in itself defeats the purpose for which the kata-thermometer and effective temperature indexes were designed.—C. L. B.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

DISEASES CAUSED BY WORKING WITH PNEUMATIC TOOLS. *M. Seyring. Arch. f. Gewerbepath. u. Gewerbehyg., 1930, vol. 1, no. 3, pp. 359–375.*

Contrary to expectation, pneumatic tools have not been found to cause much occupational trouble. The subject has been investigated in Germany and in England; there are, however, certain results, after prolonged use of the tools, upon the vascular system, the muscles, and the joints. Raynaud's disease is described among cleaners of castings with pneumatic tools. The right hand holds the handle of the tool, and the left the chisel itself. General health is unaffected; but a high percentage of workers complain of dead fingers with loss of sensation, as if the fingers had been put in cold water. Of those who had worked three years, half complained. Of ninety positive cases, sixty had trouble only in the fingers of the left hand; five in the right hand only; and the remainder partly in both hands. The little finger is almost always the one most affected; and one man attributed gan-

grene of his little finger to this cause. Severe forms occurred only among men over 50, and arteriosclerosis may then be a factor. The affections of the muscles are much rarer than those of the vascular system, and only three were found. They all had atrophy of the muscles of the ball of the thumb and the neighboring muscles, and in one case there was atrophy of the extensors of the thumb with sensory disturbances. This atrophic condition is probably due to direct pressure on the muscles and nerves, and the median nerve in particular. Ten cases of joint trouble were found, and in eight of them the right elbow was concerned. They were mostly hewers in mines. The duration of work before the joint trouble varied very much. In one case it was three years, but usually it was from six to ten years. —A. J. C.

OCCUPATIONAL SYMPTOMS SEEN AMONG MEN USING PNEUMATIC TOOLS. *A. Feil. Méd. du travail, Sept., 1930, Compt. rend. du Congrès, pp. 391–393.*

An examination of twenty-three men employed on road repairing indicated that they experienced some trouble from using pneumatic tools, of which the most characteristic was a sensation of deadness in the fingers of the right hand, with some diminution in sensation and power. This symptom was more severe in cold weather. Some men also had muscular cramps, and trembling of the hands. Slight deafness and buzzing in the ears was also fairly general. But these phenomena were not severe; they particularly affected young men, who had not become used to their work; they were slight or nonexistent for older workers who had become adapted to their occupation, and knew how to use their pneumatic tools with the least effort. The author considers that work with these tools should be limited in duration and should be alternated with other work which does not bring the same muscles into play.—E. L. C.

TENDOVAGINITIS CREPITANS IN METAL WORKERS. *A. I. Ivantchenko. Kazansky med. jur., March, 1930, vol. 26, p. 274.*

RESPIRATORY DISEASES AMONG WORKERS EMPLOYED AT THE OURTAK TOBACCO FACTORY. *N. A. Novikoff. Abstr. as follows from Pensée méd. d'Usbequistane et de Turqumenistane, 1929, No. 2–3, pp. 25–32 (French summary p. 147), in Bull. Hyg., July, 1930, vol. 5, pp. 572–573.*

A short description is given of the work carried on at a tobacco factory; 200 workers were medically examined; 109 at their work of sorting and manipulating tobacco were exposed to dust, while the remaining ninety-one employed in the packing and other departments had no exposure to dust. The investigators found it necessary to separate smokers from nonsmokers, as the habit of smoking would introduce a possible dust exposure. The investigation indicated that dust of tobacco, on account of its shape and chemical properties, possesses the capacity of irritating the mucous membranes, so increasing the percentage of respiratory diseases experienced by workers at tobacco factories. During the first years of exposure to the dust hypertrophic changes of the respiratory passages occur; but later these diminish while atrophic changes increase.—E. L. C.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

ACUTE RESPONSE OF GUINEA PIGS TO VAPORS OF SOME NEW COMMERCIAL ORGANIC COMPOUNDS. IV. ETHYLENE OXIDE. *C. P. Waite, F. A. Patty, and W. P. Yant. U. S. Pub. Health Rep., Aug. 8, 1930, vol. 45, pp. 1832–1843.*

The acute physiologic response of guinea-pigs to air containing ethylene oxide was determined. The concentration of vapor and periods of exposure ranged from those which produced death to those which caused no apparent effect after several hours' exposure. The symptoms, gross pathology, and fatality are given, with a discussion of the potential health hazards.

1. In the order of occurrence the symptoms produced are nasal irritation, eye irritation, blood-tinged, frothy, serous exudate from nostrils, unsteadiness on feet and staggering, inability to stand, respiratory disturbances, dyspnea and gasping, and death. Most of these symptoms occurred with exposures to concentrations of 8.5 to 0.3 per cent. by volume. Eye and nose irritation were the principal symptoms with exposure to 0.13 and 0.06 per cent.; no distinct symptoms were observed with exposure to 0.025 per cent.

2. The principal gross pathologic change was marked irritation of the respiratory system. This was most prominent in animals that died within a few hours following exposure. Lobar and lobular pneumonia and parenchymatous changes in the kidneys were noted in the animals that died two to six days following exposure.

3. Exposure to 5 to 10 per cent. causes death after a few minutes' exposure; 0.3 to 0.6 per cent. for thirty to sixty minutes is dangerous to the life of guinea-pigs; 0.3 per cent. is the maximum for sixty minutes without serious disturbances; and 0.025 per cent. is the maximum allowable concentration for several hours without serious disturbances.

4. From the standpoint of relative toxicity (concentrations causing acute harm) ethylene oxide is less harmful than hydrogen chloride and sulphur dioxide, more harmful than chloroform and carbon tetrachloride, and similar to ammonia.

5. Ethylene oxide does not possess enough odor to give distinct warning of harmful concentrations, but it causes intolerable irritation to the eyes and nose when present in high concentrations, and moderate though distinct irritation in comparatively safe concentrations. This irritation must, however, be taken as warning of a dangerous atmosphere to avoid serious injury.—*Authors' Summary.*

DANGERS IN WORK WITH CELLULOSE LACQUERS AND THEIR PREVENTION. *Banik. Abstr. as follows from Zentralbl. f. Gewerbehyg., July, 1929, N. S. vol. 6, pp. 197–206, in Bull. Hyg., July, 1930, vol. 5, p. 569.*

A rather lengthy account is given of the nature of the solvents of nitrocellulose used now on a very wide scale in spraying articles, automobiles, and railway carriages. These solvents and thinners constitute 30 to 60 per cent. of the lacquer. The thinners may be benzine, benzene, toluene, xylene, and

alcohols. When rapid drying is required, the low boiling esters of acetic acid, methyl and ethyl acetate, are used. Other substances described are butyl and amyl acetate, hexalin acetate and its three methyl derivatives.

With the exception of benzene, the destructive action of which on the blood forming tissues is well known, the substances used are found to have no very serious effects. Headache and giddiness, oppression of the chest, and dermatitis from removal of the fat from the hands leading to dryness and cracking, are the main results. Stress is laid, however, on the discomfort experienced by the workpeople in the atmosphere of spray in which they must work in the absence of locally applied ventilation to remove it.

Illustrations [not very easy to follow and consequently not worth while to reproduce] and description of methods of controlled work are given.—T. M. L.

HISTOCHEMICAL DETECTION OF GOLD AND LEAD. *H. Okkels. Abstr. as follows from Compt. rend. Soc. de biol., 1929, vol. 102, pp. 1089–1091, in Bull. Hyg., July, 1930, vol. 5, p. 566.*

Methods found of value for disclosing the presence of gold and of lead in organic tissues are described. For gold the materials are fixed in alcohol and embedded in paraffin, then the sections are treated with an acidified 5 per cent. aqueous solution of chloride of tin, in which they are left for thirty-six hours. Under these conditions the gold is reduced and appears as dark-colored grains. Doubt as to the origin of the grains may be removed by treating with a solution of potassium chloride in which gold is soluble. For detecting lead small pieces of tissue are fixed in Almkvist's liquid (100 parts of a concentrated aqueous solution of picric acid to 1 part of a 5 per cent. solution of nitric acid, which has been saturated with sulphuretted hydrogen and then filtered). After two days the material is washed in water for twenty-four hours and embedded in paraffin. Deposits appear black in sections on a yellow ground. The black grains are not entirely characteristic of lead, as iron and mercury are similarly precipitated. Mercury can usually be excluded by the history of the case, and iron by staining a slide with Turnbull blue.—E. L. C.

NEW INVESTIGATIONS ON THE ABSORPTION OF LEAD AND ITS DISTRIBUTION IN THE ORGANISM IN EXPERIMENTAL POISONING. I. *Weyrauch. Abstr. as follows from Ztschr. f. Hyg. u. Infektionskrankh., 1930, vol. 111, pp. 162–179, in Chem. Abstr., July 20, 1930, vol. 24, p. 3560.*

To determine the lead in blood, the blood is digested with sulphuric acid, treated with hydrogen sulphide and the precipitate redissolved, subjected to electrolysis, and finally the lead is determined colorimetrically. The method is modified for the analysis of organs and bones. White lead injected subcutaneously into rabbits is found chiefly in the bones; very little is absorbed by the organs. Quantities of lead are found in the liver, kidneys, bones, and blood of rabbits fed with white lead. Individual variations are noticed.—P. D.

METHODS OF INVESTIGATION IN INDUSTRIAL HYGIENE. INHALATION EXPERIMENTS ON ANIMALS WITH WEIGHABLE QUANTITIES OF LEAD

OXIDE FUME IN RELATION TO THE OCCURRENCE OF LEAD POISONING IN LEAD BURNERS. *V. Froboese and H. Brückner. Abstr. as follows from Arch. f. Hyg., 1929, vol. 101, no. 3, pp. 161–172, in Bull. Hyg., July, 1930, vol. 5, p. 566.*

In this paper are given details of the apparatus (clearly illustrated) and procedure adopted in obtaining the results previously described by Froboese. (See THIS JOUR., 1929, vol. 11, Abstr. Section, pp. 243–244.)—T.M.L.

WEAKNESS OF THE EXTENSOR MUSCLE IN LEAD POISONING. *B. B. Koiransky. Abstr. as follows from Zentralbl. f. Gewerbehyg., March, 1929, N. S. vol. 6, pp. 65–71, in Chem. Abstr., Nov. 20, 1930, vol. 24, p. 5897.*

This weakness is found in 42.8 per cent. of workers in white lead, 66.6 per cent. of accumulator workers, and 70 per cent. of the letter press workers. The low percentage in the white lead workers is due to the fact that there is a rapid turnover, while in the other trades this is not the case.

INVESTIGATION OF THE BEHAVIOR OF THE BLOOD PRESSURE AND THE HEART ACTION IN LEAD POISONING. *J. R. Petroff. Abstr. as follows from Naunyn-Schmiedebergs Arch., 1930, vol. 148, pp. 330–341, in Ber. ü. d. ges. Physiol. u. exper. Pharmakol., Oct. 22, 1930, vol. 56, pp. 394–395.*

Data in the literature show that the effects of lead on the circulation are different in acute and chronic poisoning: In acute poisoning there has been observed (Tanquerel, Pawlenko) a lowering of the blood pressure and a slowing of the heart action, while in chronic poisoning increased blood pressure and acceleration of the heart action occur. Teleky and Goadby trace pallor of the face in lead poisoning to vascular constriction; also ophthalmologic observations suggest vasomotor disturbances in the eye (Elschnig). Moreover, in the isolated organ constriction of the vessels has been observed (Tscherkess and others). Clinical examinations of lead workers showed hypotension in some cases and hypertension in others (for example, according to Tschelzowa, there were 34 per cent. with hypotension and 12.9 per cent. with hypertension). These facts induced the author to undertake experiments on animals (rabbits and dogs) for the purpose of studying the effect of lead poisoning on the blood pressure and the heart action; simultaneously quantitative observations on the blood sugar as well as on the blood cholesterin were made. Acute as well as chronic lead poisoning followed inhalation of lead (amounts: 20 to 94 mg. per cubic meter of air; particle size: 92 per cent. under 1 micron, 8 per cent. from 1 micron to 5 microns), in the dust chamber of the Leningrad Institute for Industrial Hygiene and Accident Prevention. In lead poisoning produced in this way, in the first stage there occurred hypertension, tachycardia, hyperglycemia, and hypercholesterinemia, which were traced to an increased tonus of the sympathetic nervous system. In a later stage, there were observed fluctuations in the blood pressure (lability in the tonus of the sympathetic nervous system), with hypertension still persisting, accompanied by colic-like attacks in many of the dogs, and finally, hypotension.—M. C. S.

ACUTE RESPONSE OF GUINEA PIGS TO VAPORS OF SOME NEW COMMERCIAL ORGANIC COMPOUNDS. V. VINYL CHLORIDE. *F. A. Patty, W. P. Yant, and C. P. Waite. U. S. Pub. Health Rep., Aug. 22, 1930, vol. 45, pp. 1963–1971 (Reprint No. 1405).*

The acute physiologic response of guinea-pigs to air containing vinyl chloride was determined. The concentrations of vapor and periods of exposure ranged from those which produced death to those which caused no apparent effect after several hours' exposure. The symptoms, gross pathology, and fatality are given with a discussion of potential hazards.

1. The symptoms are principally those of narcosis. They range from unsteadiness and motor ataxia to incomplete and, finally, complete narcosis. The respirations vary from a rapid, jerky type accompanying the beginning of narcosis to a later, slow, shallow type.

2. The principal gross pathologic findings were congestion and edema of the lungs, with hyperemia of the kidneys and liver.

3. Exposure to 20 to 40 per cent. kills guinea-pigs in a very short time; 10 per cent. is dangerous to their lives after thirty to sixty minutes' exposure; and 0.5 per cent. is the maximum allowable amount for several hours without acute disturbances of a serious nature.

4. With regard to relative toxicity (concentrations causing acute harm), vinyl chloride is less harmful than carbon tetrachloride and chloroform, and is similar to ethyl chloride.

5. The danger from explosion exceeds the health hazard from exposure.

6. Vinyl chloride does not possess adequate warning properties of the odor or irritation type. It gives warning, however, by producing symptoms of dizziness and disorientation in advance of harm, except when present in exceedingly high concentrations which would cause almost immediate helplessness and unconsciousness.

7. The narcotic action of vinyl chloride and its comparatively low toxicity suggest its possible use for surgical anesthesia.—*Authors' Summary.*

DUST HAZARDS AND THEIR EFFECTS

THE EFFECTIVENESS OF DIFFERENT-SIZE ROCK DUSTS IN PREVENTING COAL-DUST EXPLOSIONS IN MINES. *G. S. Rice, H. P. Greenwald, and H. C. Howarth. U. S. Bur. Mines, Rep. Investigations, Serial No. 3034, Sept., 1930, pp. 10 (mimeographed).*

Rock dusts of such a size that all will pass through a 20-mesh screen and that 50 per cent. or more will pass through a 200-mesh screen were mixed with varying proportions of fine Pittsburgh bituminous coal of approximately the same fineness and tested in the experimental station of the Bureau of Mines for their ability to prevent coal dust explosions.

The authors summarize their results as follows: ". . . . fine rock dust is slightly more effective in extinguishing incipient coal-dust explosions than coarse dust, but the difference is so small that it has no practical significance. Any rock dust that meets and

is maintained under the standard specifications will be satisfactory in so far as coal dust explosion quenching power is concerned. The size best suited for different methods of distribution must be determined by the management of the respective mine."—P. D.

INFLUENCE OF VARIOUS KINDS OF DUST ON THE HEALTH OF MAN, ANIMALS AND PLANTS. *E. Natho. Abstr. as follows from Rauch u. Staub, 1929, vol. 19, p. 124; Wasser u. Abwasser, vol. 27, p. 98, in Chem. Abstr., Nov. 20, 1930, vol. 24, p. 5906.*

This is a general discussion of corrosive, noncorrosive, explosive, and toxic dusts. Electric methods of eliminating many kinds of dusts are recommended. Lead and arsenic dusts are most toxic. Strong bases, such as barium hydroxide and calcium hydroxide, and basic salts act directly upon the mucous membranes of the nose, throat, and lungs, while cement and air-slaked lime produce only deposits in the lungs.—P. D.

EFFECT OF DUST ON THE LUNGS. REPORT OF THE COMMITTEE ON SILICOSIS PRESENTED TO THE INDUSTRIAL HYGIENE SECTION OF THE AMERICAN PUBLIC HEALTH ASSOCIATION. *Am. Jour. Pub. Health, April, 1930, vol. 20, pp. 368–379.*

This report deals principally with the incidence of silicosis. Significant findings in the reports which appeared in 1929 are summarized. Some of these findings are:

The dust hazard in industry is assuming more and more importance from the standpoint of health. The sandstone industry represents the most widespread of all silicosis producing industries.

Silicosis may be classed under two headings: uncomplicated silicosis, in which no infective element is present; and silicosis complicated by infective processes, of which the most common is tuberculosis.

The ferruginous pigment found in the lungs of both miners and nonminers is derived from the blood and not from the exogenous substance inhaled.

The close relation between the extent of dust exposure and the health of granite workers is shown by the studies of the United States Public Health Service.

South African investigators think that simple silicosis should be considered in a majority of cases as a dust fibrosis linked up, from its beginning as a clinically detectable condition, with an element of latent tuberculosis.

The progressive character of silicosis is stressed.

There is a difference of opinion in regard to the suggested treatment of silicosis by the administration of a nonsilicious dust, such as coal dust.

Investigators agree that efficient methods of removing or allaying dust, examination of men both before beginning work in the dusty trades and periodically thereafter, and the elimination of the tuberculous are of value in the prevention of silicosis.—C. E. B.

THE RELATION OF DUST TO INFECTION. *E. H. Kettle. Proc. Roy. Soc. Med., Nov., 1930, vol. 24, pp. 79–94.*

A useful and thoughtful summary of the present pathologic position with regard to dust diseases is presented. All dangerous dusts are recognized to

have one factor in common: they all contain free silica. This dust gradually sets up chronic fibrosis in the lung, as a reaction to dust particles carried into it from the alveoli. No means are known for interfering with this reaction by mixing silica with any other dust; nor is it certain that the action of the silica can be expedited by the addition of such an alkaline dust as sodium carbonate. Coal dust seems to be quite innocuous either way; while the evidence that phagocytes react differently to different dusts is distinctly doubtful. What appears certain is that silica reacts chemically rather than physically with the tissues of the lungs; hence fibrosis results. The puzzle is why such silicotic fibrosis is particularly liable to become tuberculous. Gardner, working with a strain of low virulence, has shown that silica dust has a great capacity for reactivating healing tuberculous lesions, or, if the lungs be dusted first, of delaying the healing process. Kettle himself has shown that necrotic foci set up by silica become sites where tubercle bacilli, subsequently injected, tend to congregate and to multiply to a greater extent than they do in necrotic foci set up by other injurious agents. Nevertheless, exactly how the silica acts is still doubtful; but the suggestion has been made by South African workers that silica may actually damage the tubercle bacillus so as to lower its virulence.—E. L. C.

REPORT UPON THE WORK OF THE MINERS' PHTHISIS MEDICAL BUREAU FOR THE YEAR ENDED 31ST JULY, 1929. *Union of South Africa. Pretoria, Govt. Printer, 1930, pp. 64.*

The work of the Medical Bureau stationed at Johannesburg is described; it is mainly concerned with issuing certificates of fitness for underground work to men desiring to be employed in the gold mines, and with periodic examinations of miners already at work. One objective of the Bureau is to eliminate tuberculous persons, so as to reduce to a minimum the possibility of spreading infection, for miners who have developed silicosis from dust exposure during their occupation are particularly liable to contract tuberculosis.

A decline in the production of simple silicosis, which was first noted for 1927, has continued so that 490 new cases in the year 1925 to 1926 fell away to 283 new cases in the year 1927 to 1928, and to 270 in the year 1928 to 1929. Reasons are given for considering this fall to be associated with modern conditions of work, which now are beginning to benefit even the older miners employed before conditions were improved. Among the men who have been employed under only the new conditions, the incidence of simple silicosis is satisfactorily low; but the number of these men who have worked for more than ten years is not large, so that no definite opinion can yet be expressed as to whether the present exposure to dust is below the threshold of risk. The average duration of employment of those who become silicotic has increased from 114 months for cases detected in the year 1919 to 1920 to 151 months for those detected during the year under consideration; this gives an increase of more than three years in the average duration of service of new silicotics, and is very encouraging.

The report is mainly concerned with

the compensation aspect of silicosis, as seen among the gold miners, who, at any periodic examination, may be suspended from employment and given compensation if found to have contracted tuberculosis or tuberculosis associated with silicosis; if found with simple silicosis they are granted modified compensation if they choose to change their occupation. Nonretired silicotic miners are the group from which tuberculous silicotics are drawn. Cases of simple tuberculosis are distinctly below the average of the ordinary population. The native miners are still a continuing source of tuberculous infection. They seldom remain at work long enough to contract silicosis, but do break down rapidly with open tuberculosis when brought into contact with Europeans. There are ten times as many native miners as Europeans; and more than 1,000 cases of active tuberculosis were detected among these native miners during the year, each of whom is a potential source for spreading the disease among silicotic Europeans. A campaign is on foot for eliminating all tuberculous natives as rapidly as possible. The report contains the usual statistical tables, from which the work of the Bureau can be readily followed year by year.—E. L. C.

SILICOSIS—SOME GEOLOGICAL COMMENTS. *E. Morton. Abstr. as follows from Refractories Jour., 1930, vol. 5, pp. 427–433, in Chem. Abstr., Nov. 20, 1930, vol. 24, p. 5897.*

Silicosis results from hydration of free silica in the lungs. Therefore, danger to workmen depends upon the amount of free quartz and dust producing characteristics of the rock. Both can be determined from microscopic examination.—P. D.

TWO CASES OF ACUTE SILICOSIS, WITH A SUGGESTED THEORY OF CAUSATION. *G. Macdonald, A. P. Piggot, and F. W. Gilder. With a Note on the Chemical Examination of the Lung by F. Arnall and E. A. Rudge. Lancet, Oct. 18, 1930, vol. 2, pp. 846–848.*

The pathologic findings are given of two cases that had been exposed occupationally for $2\frac{3}{4}$ years and $4\frac{1}{4}$ years, respectively, to inhaling powder containing 75 per cent. pure silica, the remaining 25 per cent. being soap powder containing sodium carbonate and soap. The patients died from acute silicotic fibrosis of both lungs, which, on examination, showed no collapse, although there were no adhesions. The lungs were bulky and heavy, preserving their anatomic shape. The glands were much enlarged and tough. No evidence of the presence of tuberculosis was detected. The suggestion is put forward that the presence of the sodium carbonate expedited the conversion of silica into a colloidal form, in which it reacted with calcium and iron salts present. Thus occurred a deposition of insoluble silicates steadily choking up the lungs. If this form of rapid silicosis results from the inhalation of silica dust with small supplies of alkali, slow silicosis may be the reaction of inhaling silica with the small amount of alkali normally present in the lungs. Chemical examination showed the presence of 2.7 gm. of silica per 100 gm. of dry lung in the vicinity of main ducts, 109 gm. in intermediate areas, and 0.65 gm. in remote

areas. It indicated the presence in the affected lungs of (1) combined silica, (2) free silicic acid derived from combined silica, and (3) original crystalline silica. Suggestions are made as to how, in the manufacture of soap, the silica dust hazard may be reduced to a minimum. The interest in these cases centers upon the light which they throw on the development of chronic silicosis.—E. L. C.

COMBATING SOOT AND DUST. *W. Gumz. Abstr. as follows from Feuerungstech., 1930, vol. 18, pp. 64–70, 117, in Chem. Abstr., Nov. 20, 1930, vol. 24, p. 5972.*

In certain cases, the use of bag filters in power plants to overcome soot and fly ash may be profitable, as it avoids the use of tall chimneys and the possibility of damage suits. The gases must be cooled to 110°. An experimental unit is briefly described; the smoke removal was practically perfect. —P. D.

ZINC DUST IN INDUSTRY: ITS ACTION ON THE HEALTH OF THE WORKERS AND ITS ACCUMULATION IN THE ORGANS. *D. Nuck, E. Remy, and F. Holtzmann. Abstr. as follows from Reichsarbeitsbl. (8), 1929, vol. 3, p. 92; Jour. Inst. Metals, 1929, vol. 42, p. 695, in Chem. Abstr., July 20, 1930, vol. 24, p. 3578.*

The dust produced in zinc spraying processes is essentially metallic zinc, which, however, rapidly burns to oxide. Tests on animals showed the characteristics of lead poisoning, although the zinc contained only 0.213 per cent. of lead. The zinc absorbed is rapidly eliminated, the excreta being free from the metal twelve days after exposure of the animal to the fumes, and no accumulation of the metal in the body could be observed.—P. D.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

ON THE CAMPAIGN AGAINST ANTHRAX. *P. Uhlenhuth. Abstr. as follows from Zentralbl. f. Gewerbehyg., Jan., 1930, N. S. vol. 7, pp. 24–27, in Bull. Hyg., Nov., 1930, vol. 5, pp. 877–878.*

The question of anthrax infection in tanneries, both from the point of view of man and of animals, is an important one, and Uhlenhuth thinks that an anti-anthrax campaign is necessary. Disinfection of hides and the application of the Ascoli reaction as a means of diagnosing infected skins are suggested as the means of improving the position. The former method is well known and of considerable use; but the latter promises to be important. It has been used at Hamburg and has disclosed infection coming from such widely separated countries as Colombia, Australia, China, West Indies, India, and Africa, and in some cases—especially the first three—the number of infected skins has been very considerable. The main source of infection is cattle hides.—T. W. M. C.

A FATAL CASE OF ANTHRAX IN A MAN. *A. Chretien and A. Julien. Abstr. as follows from Bull. Acad. vét. de France, 1929, vol. 2, pp. 388–390, in Bull. Hyg., Nov., 1930, vol. 5, p. 878.*

The patient was an electrician in a

large leather factory where foreign hides are used, mainly from Africa, Spain, India, and Brazil. Cases of anthrax occur not infrequently among the employees, but the patient did not handle the hides. The lesion was a "malignant edema" of both eyelids and rapidly proved fatal despite early treatment. The medium of infection is regarded as dust and the infection is supposed to have traversed the conjunctiva. [The reviewer has seen such a case which recovered under heroic intravenous doses of serum; whether the manner of infection in such a case is by dust falling on the eye, or by rubbing the eyes with the hands, is impossible to determine.]—C. O. S.

TREATMENT OF ANTHRAX. *B. Peričič. Abstr. as follows from Med. Klin., 1929, vol. 25, pp. 1361–1363, in Bull. Hyg., Nov., 1930, vol. 5, p. 878.*

Peričič states that surgical treatment of malignant pustule has now generally given place to serum injections. But he is doubtful if the serum is really as useful as is supposed, because he had similar or even better results in a series of 104 cases in which he employed a conservative, nonirritative therapy. Serum, if given intravenously, should be given with great care and only in exceptional circumstances.—T. W. M. C.

ON THE RELATIONS OF SILICOSIS AND TUBERCULOSIS. *R. F. Vaccarezza and E. Savino. Abstr. as follows from Semana méd., 1929, vol. 36, pp. 1624–1641, in Bull. Hyg., July, 1930, vol. 5, pp. 561–562.*

The idea which had held the field for many years that anthracosis was due to inhalation of carbon particles received a shock when Jousset in 1928 announced that the black pigment present in the lungs was due not to carbon, but to iron of hematogenous origin, resulting from congestive and inflammatory processes. He maintained that the melanosis was proportionate to the iron content of the parenchyma and the yellowish and black pigments were but degrees of oxidation of the iron from the blood. Among miners there might be some carbon, but it leads to no sclerosis as silicosis does, and neither has any effect on the course of the tuberculous process when this disease is present.

The authors carried out careful investigations on the lungs of two miners dying of tuberculosis and with associated anthracosis. The black pigment was found to be in the vascular perithelium, that round the bronchi and in the submucosa, and was due to carbon. They find that in anthracotic lungs the amount of iron is definitely greater than in normal lungs and to a certain extent proportional to the intensity of pigmentation; in other words there are two kinds of pigment, carbon and iron. *Pure* anthracosis is very rare in nature, but is unassociated with sclerosis or the presence of iron; usually it is combined with silicosis and it is the silica which is responsible for the sclerosis and the iron, the condition being a mixture—anthracotic silicosis, in the authors' nomenclature. If silica is inhaled alone, the atmosphere being free of carbon, sclerosis is produced with little or no appreciable increase of pigment. Silica in a colloidal state causes inflammation resulting in sclerosis not only in the lungs, but in other organs, notably the kidneys and the liver. Knowledge of this condition will ex-

plain the lesions of so-called miners' and stonemasons' phthisis with absence of tuberculosis, though silicosis favors the development of pulmonary tuberculosis, usually running a long course. [The paper contains some good microphotographs of the pathologic lesions in the lungs.]—H. H. S.

Is Undulant Fever an Industrial Disease? *C. Dubois and N. Sollier. Abstr. as follows from Bull. Acad. de méd., 1930, vol. 104, pp. 166–173, in Bull. Hyg., Nov., 1930, vol. 5, p. 882.*

The authors answer this question in the affirmative. In southern countries undulant fever constitutes a veritable scourge owing to its frequency (300 to 400 cases a year in Le Gard), its prolonged duration (four to five months on the average), and its tedious sequelae. Its mortality, moreover, is far from negligible (about 4 to 5 per cent.). During the last twenty years all those who have studied and written on the subject have emphasized the fact that certain occupations in France pay a heavy tribute to the disease. The authors contribute the following additional evidence of undulant fever being an industrial disease:

1. Cases notified by practitioners in Le Gard and neighboring departments in reply to a questionary as to the incidence of the disease during the last three to five years. Of 355 such cases, 125 occurred in shepherds or small proprietors, 99 in farm laborers, 8 in gardeners, 5 in sheep shearers, and 15 in persons engaged in various trades.

2. Cases observed in the hospitals in Nîmes during the last five years. Of 60 such cases, 20 were in farm laborers, 4 in shepherds, 3 in gardeners, 1 in a butcher, 1 in a tripe dresser, and 27 in persons belonging to other trades.

3. Cases collected by Imbert at the hospital at Arles in the period 1922 to 1927. Of 65 such cases, 39 were in farm laborers, 7 in shepherds, 6 in proprietors engaged in rearing cattle, and 8 in townspeople of different professions.

Infection takes place: (*a*) accidentally, by ingestion of contaminated milk or cheese, or of vegetables and raw fruit from gardens fertilized with the manure of goats or sheep; (*b*) more frequently, professionally, as the result of handling infected animals or their products. While accidental contamination can be avoided, professional contamination is inevitable. The patients, therefore, should benefit by the law which grants special compensation to the victims of industrial diseases.—J. D. R.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

Present Views on Sensitization in the Diagnosis of the Traumatic Dermatoses: Chemical Actions on the Dead Integument. *R. P. White. Jour. State Med., Sept., 1930, vol. 38, pp. 528–536.*

The author makes some attempt to clear up obscurities in connection with the reactions of human skin to external agents. First he points out that agents act similarly upon either living or dead skin; instances are drawn from tanneries, where strong salt solutions dehydrate pelts, just as they dehydrate living skin. The action of lime and sulphides is quoted as a further instance. Such reactions of agents upon skin, living or dead, have no relation

to sensitization. The products of such reactions in the living body set up inflammation, which is followed by healing processes. Proteins, released into the tissues as the result of such reactions, may cause a state of sensitization, from which the case may recover and pass to one of immunity. In every instance, the chemical and the protoplasm upon which it acts must be taken into consideration. It is a rule that only proteins can act as true antigens; and this rule is not broken when a non-protein agent applied to the skin reacts with it to set free a protein from the living protoplasm. The meaning of the writer is, at times, difficult to grasp, on account of indiscriminate use of obscure words. —E. L. C.

A New Occupational Dermatitis Seen in the Phosphorus Industry. *J. Nicolas, J. Gaté, and J. Rousset. Méd. du travail, 1930, vol. 2, Compt. rend. du Congrès, pp. 331–336.*

The author reports having seen cases of dermatitis set up by handling sesquisulphide of phosphorus, which is made at one factory which holds the monopoly of this product used in the manufacture of safety matches in France. Among those affected, the skin becomes flushed; subsequently blebs form, which suppurate. Folds of the skin or damp places are particularly concerned. Conjunctivitis also occurs from the dust. The dermatitis rapidly dries up, after which exfoliation of the skin takes place. Recovery is usually rapid after exposure to the cause is stopped. Traces of phosphorus, 0.2 gm. per liter, were found in the urine. The patients gave off a pronounced odor of phosphorus, which also affected their clothes. Experiments were carried out by applying the compound to the skin, when similar lesions were caused; it appears to act through its solubility in the sebaceous secretion. Dermatitis due to this cause is hardly new, as suggested by the author, since cases have been reported frequently by others.—E. L. C.

Occupational Dermatitis in Peasants. *K. A. Promachin. Kazansky med. jur., March, 1930, vol. 26, p. 299.*

Intraocular Foreign Bodies. A Review of 101 Cases. *C. N. Spratt. Am. Jour. Ophth., Dec., 1930, vol. 13, pp. 1079–1083.*

The author has seen 101 intraocular foreign body injuries in ninety-eight individuals among 15,000 eye patients in the last twenty-five years. He discusses the location and type of the foreign bodies, and the diagnosis, treatment, and results of these cases.

On the Technic of Roentgenographic Localization of Foreign Bodies in the Orbit. *S. S. Golowin. Abstr. as follows from Russk. opht. jur., April, 1930, vol. 9, pp. 444–448, in Am. Jour. Ophth., Oct., 1930, vol. 13, p. 932.*

For the localization of intraorbital foreign bodies Golowin suggests the insertion of two pins 3 cm. long into the orbit at its lower-inner and lower-outer angles. A lateral roentgenographic study is then made. A case is reported in which the usual routine technic of orbital roentgenography failed to show the position of the foreign body, while the use of the

author's method resulted in its exact localization in the upper orbital wall near the apex.

CLINICAL EXPERIENCE WITH MY METHOD OF ROENTGENOLOGIC LOCALIZATION OF AN INTRAOCULAR FOREIGN BODY. *W. Altschul. Abstr. as follows from Klin. Monatsbl. f. Augenh., June, 1930, vol. 84, p. 838, in Am. Jour. Ophth., Oct., 1930, vol. 13, p. 936.*

The method depends on the use of a corneal marker and on five exposures with the eye looking forward, then up, down, nasal, and temporal at 30° with the sagittal axis of the eye. From measurements taken and the help of elaborate tables one can determine the center of rotation of the eye and the nearest superficial point to the foreign body, as well as its location in the eyeball. Among forty-nine cases of intraocular foreign body there were twelve which could serve to test the value of the method. In these, the foreign body was either nonmagnetic or so located that simple application of a magnet was ineffectual. In nine of these twelve cases the foreign body was instantly found at operation. In two of the three remaining cases the calculations had been incorrectly made in the author's absence, and in one case the foreign body, which was calculated to be within the bulbus, had actually become lodged in the superior oblique muscle.

INVESTIGATIONS ON THE EMISSION CURVE OF GLOWING GLASS IN A GLASS FACTORY. *H. Schläpfer. Abstr. as follows from Klin. Monatsbl. f. Augenh., May, 1930, vol. 84, pp. 663–671, in Am. Jour. Ophth., Oct., 1930, vol. 13, p. 938.*

The investigations, which are described in detail, showed the fact, hitherto not experimentally established, that the maximal intensity of emission from molten glass lies at 2,000 millimicrons, abruptly declining to 1,000 millimicrons and then gradually to the red waves; so that visible light and ultraviolet have no practical significance in comparison with the short-waved ultra-red. This confirms the results obtained from experiments made at Vogt's clinic, namely, that the ultraviolet of the arc lamp and of the high intensities of the mercury vapor lamp, even upon long exposure, cause no opacities of the lens, whereas such opacities are caused by the ultra-red from the arc lamp. The more permeable a medium is for a certain radiation the less it is damaged by it. Hence it is probable that visible light even at highest intensity cannot injure the lens, because it readily penetrates it, but does injure the pigment epithelium by which it is absorbed, and consequently exerts thermic and chemical actions.

A NEW INDUSTRIAL RETROBULBAR NEURITIS. *H. Goldmann. Abstr. as follows from Klin. Monatsbl. f. Augenh., June, 1930, vol. 84, p. 761, in Am. Jour. Ophth., Oct., 1930, vol. 13, p. 924.*

A Duco sprayer's helper, who worked without a mask, became afflicted with a typical acute retrobulbar neuritis which healed completely in nineteen days after the patient was removed from the paint spray vapor.

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

PREVENTION OF INDUSTRIAL ACCIDENTS. *J. de B. Barreto. Abstr. as follows from Arch. de hyg., 1929, vol. 3, pp. 243–264 (English summary), in Bull. Hyg., July, 1930, vol. 5, pp. 577–578.*

This is a valuable paper in summarizing the means by which accidents in industry may be prevented or minimized, although nothing novel is presented. The author shows that accidents may occur from unfitness in the workman; that preliminary examination as to his physical condition should precede his engagement; and that periodic examination afterwards should also be arranged for. According to the nature of the work, measures of individual protection must not be neglected, such as the use of special clothes, or of protective glasses where fragments of metal, for example, may cause injury. Research into industrial fatigue is important in the application of its results. Also the arrangements for meals and the general comfort of the workers, good lighting and ventilation, and safeguarding of the machinery should be attended to; in fact, the workman should be as carefully attended to abroad as he is in England. For these purposes it would be well to have a specialist in industrial hygiene attached to the larger business houses.—H. H. S.

CONSISTENCY OF OPERATING EFFICIENCY. *C. S. Slocombe. Personnel Jour., April, 1930, vol. 8, pp. 413–414.*

During two years of accident reduction work with individual employees of the Boston Elevated Railway, collisions between street cars and automobiles have been reduced by 2,000, or 35 per cent. This result has been obtained because of the number of accident prone men who have been successfully cured. The treatment of so-called accident prone men has brought out the question as to the consistency of safe operating efficiency over a number of years. In order to determine this, a study was made, over a period of four years, of all the motormen (260) in one division. From this study the author draws the following conclusions:

1. Over four years the number of accidents a man has depends to the extent of 76 per cent. on his operating efficiency and 24 per cent. on sporadic or uncontrolled conditions.

2. This statement implies that accident prone men are on the whole higher than the average in their accidents 76 per cent. of the time.

3. This does not, however, imply that operating efficiency cannot be improved, for safety work has been done during the past two years favorably affecting the accidents of the men here studied.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

VITAL CAPACITY IN COLLEGE WOMEN. I. STANDARDS FOR NORMAL VITAL CAPACITY IN COLLEGE WOMEN. *A. H. Turner. Arch. Int. Med., Dec., 1930, vol. 46, pp. 930–937.*

The study of the vital capacities of

1,337 freshman women at Mount Holyoke College has resulted in the presentation of a set of statistical data, regression equations, and charts relating vital capacity to height, weight, and surface area. The correlation with standing height is the best and with surface area only slightly less good. As previously determined, the weight correlation is distinctly less close.—*Author's Summary.*

VITAL CAPACITY IN COLLEGE WOMEN. II. A STUDY OF STUDENTS WITH HIGH AND LOW VITAL CAPACITY. *A. H. Turner. Arch. Int. Med., Dec., 1930, vol. 46, pp. 938–945.*

A comparative study of students whose vital capacity was more than 15 per cent. above or below the average for their heights was made to determine whether the group with low vital capacity showed signs of disease and whether, also, there were indications that vital capacity is an important function for judging physical fitness. These students were found in five freshman classes at Mount Holyoke College; there were 121 with high vital capacity and eighty-five with low vital capacity. Two classes were studied for four years, with two conferences each year for each student. The other classes were studied for shorter periods, as their year of entrance made possible.

While in a few instances there seemed to be direct association of low vital capacity with past or present disease of the thorax, heart or lungs, the majority of these students seemed to be young women for whom the exercise program in the years previous to college was very limited. The response of twenty-two students in one class, which has been specially trained for thoracic development, was gratifying. By whatever test this low vital capacity group was tried out, by the test of general health, of academic or of social success, it appears that it was truly at a disadvantage. There is thus the indication that vital capacity is a measurable function of significance in the general picture of the young women whose relative success in the field of health one is anxious to rate fairly. Two "morals" appear: one, the importance of sturdy exercise for girls, especially in their adolescent years, the other, the opportunity of bettering the low vital capacity and with it the general health of at least many of this group of students during their college years.—*Author's Summary.*

THE PHYSIOLOGIC FOUNDATION OF CORRECT POSTURE AND POSITION IN INDUSTRY. *H. Hebestreit. Abstr. as follows from Zentralbl. f. Gewerbehyg., Jan., 1930, N. S. vol. 7, pp. 4–12, in Bull. Hyg., Oct., 1930, vol. 5, p. 752.*

Posture in industry and the position of the worker relative to his work should be examined from these points of view—economy in energy usage, postponement of the fatigue point, and the prevention of the premature decay of the organs of the body. Different types of work are here examined from these aspects, and methods for achieving the best results are discussed. A number of verbal and pictorial illustrations of the experiments made are given.—M. E. D.

CLIMATE

THE INVESTIGATION OF ATMOSPHERIC POLLUTION. REPORT ON OBSERVATIONS IN THE YEAR ENDED 31ST MARCH, 1928. FOURTEENTH REPORT. *H. M. Stationery Office, 1930, pp. 67.*

The investigation of atmospheric pollution was transferred to the Department of Scientific and Industrial Research on April, 1, 1927, and this is the first annual report of the work carried on by that department.

In arrangement, it is similar to the previous reports. General Deposit Tables are given for eighty-one stations. Six new stations were installed during the year. Stations are classified into four groups according to amounts of deposited materials and a comparison with the classifications of stations during the preceding four years indicates that there has been little improvement in conditions of atmospheric pollution during the years considered.

Measurements of daylight at four stations in London are given for the years 1926 and 1927. Comparison of the data for the two years indicates a greater amount of sunlight during the latter half of the year 1926. Atmospheric pollution was reduced during that period because of coal shortage.

A study of the scale of shades for the automatic filter was made and the value of unit shade in terms of black and white has been determined. Errors in reading shades due to limit of sensitiveness of the eyes were shown to be less than the divisions of the scale of shades.

Research and investigation started during the year include: investigation of effect of exposure of deposit gauges; comparison of Owens' jet dust counter with other counters and determination of limits of size of particles counted; determination of amounts of sulphur in the atmosphere.—T. H.

ATMOSPHERIC POLLUTION. *G. C. Simpson et al. Abstr. as follows from Dept. Sci. Indust. Res. 14th Rep., 1930, pp. 67, in Chem. Abstr., Aug. 20, 1930, vol. 24, p. 4110.*

Very complete data on impurities deposited from the atmosphere at various observation stations in London, Glasgow, and other cities are recorded in forty-eight pages of tables. The determinations include tar, carbonaceous matter other than tar, ash, loss on ignition, total solids, sulphates, chlorine, and ammonia. A *deposit gauge* was used to collect samples. A *jet dust counter* was used to make dust counts. In London in 1927 to 1928 the deposit averaged 316 tons per square mile; in Glasgow 320 tons. The pollution was greatest in the winter months, also on weekdays. The amount of sulphates deposited in London per square mile varied from 25 to 72 tons per year. The ratio of insoluble matter to soluble in the deposits was approximately 93 to 125. Some of the methods used in measuring pollution of the atmosphere are described. Very little improvement in atmospheric pollution was noted over a fifteen-year period of observation.—P. D.

STUDIES IN ILLUMINATION. III. A STUDY OF THE LOSS OF LIGHT DUE TO SMOKE ON MANHATTAN ISLAND, NEW YORK CITY, DURING THE YEAR 1927, ESPECIALLY IN ITS RELATION TO THE

NATURE OF THE WEATHER, THE RELATIVE HUMIDITY OF THE AIR, AND THE VELOCITY AND DIRECTION OF THE WIND. *J. E. Ives. U. S. Pub. Health Bull. No. 197, June, 1930, pp. 40.*

Simultaneous measurements of total horizontal illumination were made during 1927 with Case photo-electric cells and Leeds and Northrup recording potentiometers located at the Hudson Street Hospital, New York City, where the air was smoky, and on Hoffman Island, in lower New York Bay, about 9 miles south, where the air was comparatively clear. From these records and meteorologic data the influence of weather, humidity, and direction and velocity of wind on the loss of light resulting from smoke was studied.

The absolute and percentage loss of light were determined for the locations. The percentage loss of light due to smoke was very pronounced in all weather, and was about twice as great on cloudy days as on clear. The average monthly percentage loss showed no seasonal variation, although there appeared a gradual decline throughout the year which may have resulted from a betterment of atmospheric conditions or from a change in the sensitivity of the photo-electric cells.

The loss of light depended on at least four factors: the altitude of the sun; the nature of the light, whether diffuse, from a cloudy sky, or direct, from a clear sky; the relative humidity; and the wind velocity. The percentage loss of light was a function of the altitude of the sun, the minimum loss occurring shortly after noon, the exact time depending on the weather. The average monthly losses showed a marked relation to the average monthly relative humidities, the losses increasing or decreasing with the relative humidities. With a clear sky, the average percentage loss was twice as great for a relative humidity of 65 per cent. as for 35 per cent. For a cloudy sky, the increase was not so great. The percentage loss was largely independent of the absolute humidity. Other conditions being the same, the percentage loss of light decreased as the wind velocity increased.—W. G. H.

A STUDY OF THE RELATION OF WORKING HOURS TO CLIMATE. *S. Ishihara. Internat. Labour Rev., Jan., 1930, vol. 21, pp. 70–88.*

The author is making a study of the working conditions in Japanese textile mills for the purpose of determining the effect of seasons on the health of the workers. His aim is to fix the daily hours of work scientifically according to the climate of his country, the nature of the work, and the constitution and the culture of the workers.

Accurate observations show that the health of the Japanese textile workers is heavily taxed during the period from June to September, especially in July and August, which are the hottest months in Japan. The effect is manifested chiefly by elevations in body temperature, losses in body weight, increased morbidity, and decreased output during the summer months, as compared with spring and autumn when the climate is agreeable, and as compared with winter when the mills are heated artificially.

The main conclusions reached are (*a*) that the upper limit of atmospheric conditions compatible with health is represented by a dry bulb of about 30°C. and a wet bulb of about 20°C.;

and (*b*) that from the health standpoint, the hours of work in Japan should be shorter in summer than in winter.

This is an important contribution to the literature and should be read by all those interested in the general subject of industrial hygiene.—C. P. Y.

WOMEN AND CHILDREN IN INDUSTRY

THE MATERNITY CONDITIONS OF WOMEN MILLWORKERS IN INDIA. *M. I. Balfour and S. K. Talpade. Abstr. as follows from Indian Med. Gaz., 1930, vol. 65, pp. 241–249; Jour. Assn. Med. Women in India, Aug., 1930, pp. 35–44, 49–56, in Bull. Hyg., Nov., 1930, vol. 5, pp. 834–835.*

Very little accurate information exists concerning the maternity conditions of women millworkers. In 1921 an inquiry was carried out in Bengal and Bombay City. As a result, welfare centers were started in certain mills in Bengal, while in Bombay a medical woman was appointed to organize welfare work. There are now crèches in connection with thirteen mills in Bombay City, and maternity benefits have been given for some years by two groups of mills. The present inquiry is based on records of women attending the maternity hospital specially provided for millworkers. Of the 576 cases of labor investigated, 282 were women actually working in the mills and 294 were the wives of millworkers living under the same social conditions as the first group, but not employed in the mills. These results are compared with a nonindustrial group composed of women of a rather better social position delivered in other hospitals in Bombay. In the industrial group the maternal mortality rate was 1.7 per 1,000 births, compared with 16 per 1,000 births in the nonindustrial class. The low mortality among millworkers is due to the low incidence of the toxemias and other diseases of pregnancy, and is attributed to the more active and open air life of the millworker, and to the more satisfactory diet. The infant birth weight was lower in the industrial than in the nonindustrial class. The stillbirth rate of the nonworkers in the industrial class approximated that of the nonindustrial class. That of the workers was much higher.

The report concludes with recommendations to employers for the improvement of the conditions for the expectant mothers: that light work should be provided during the later months of pregnancy; that one free meal a day or milk should be given during the last two months; and that a simple maternity home should be attached to the mill premises.—H. M. W.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

THE INDUSTRIAL MEDICAL OFFICER AND HIS WORK. *H. G. P. Castellain. Jour. State Med., Nov., 1930, vol. 38, pp. 655–665.*

The function of an industrial doctor differs from that of a general practitioner in that prevention of disease comes before treatment. He should begin by choosing suitable workers for different processes, and for this purpose he must be fully acquainted with all the processes of his factory. Then he should advise as to the best conditions of work; in fact, he should first treat the factory so that there will be less need for treating the workers. Similarly, convalescents returning to work should be interviewed, and advice given as to their capacity for being employed at their original process or at some lighter one for a time. Cases for compensation claims must be interviewed and periodically reexamined; here the physician must maintain a judicial position, not acting either for employer or for worker, but in the interests of both. The work as a whole has become so specialized as to call for training and a special diploma.

In no case must the works doctor allow himself to invade the province of the family physician; if he has to visit the home, it should only be with a view to expediting return to work. Great care must be taken to establish friendly relations with all general practitioners. Industry calls for not merely healing, but restoration of useful functions; here industrial clinics, especially with regard to physiotherapeutics, are recommended. They would carry on work after the general practitioner has dismissed his case.—E. L. C.

THE PRACTICE OF MEDICINE IN INDUSTRY. *H. W. Stevens. New England Jour. Med., Nov. 13, 1930, vol. 203, pp. 972–980.* (*Abstract by author.*)

This paper in its first pages outlines briefly the evolution of industrial medical ideas through many centuries, culminating in workmen's compensation early in the present century; also the introduction of medical practice into industry as an employers' compensation measure.

In discussion of the surgical and medical problems of an industrial medical service a contrast is drawn between the volume of specifically industrial cases and that of nonindustrial cases, which comprise a majority of the clinical problems of the industrial physician and constitute an unprecedented public health opportunity.

The view is expressed that lack of uniform and stable administrative principles governing medical service in industry constitutes the most serious problem of the physician endeavoring to practise sound medicine within a business organization. A specific instance is presented illustrating default of responsibility for an industrial medical service incident to a change of administration of the business; and the violation of recognized medical principles possible under present lack of established standards.

Attention is directed to the increasing extra-medical interest in business and other social problems of health and the suggestion is made that activities arising from this interest may be leading toward a hygiene of industry more effectual than the strictly medical program based so largely upon the concepts of pathology.

The encouraging new outlook in the field of business administration is introduced as a portent of a better administration of industrial and other organized medicine, providing a more

trustworthy guarantee of the preservation of the *personal* relation of physician and patient, which is the first principle of effective medical practice.

In view of the present instability and uncertainty, the writer suggests as one safeguard of this first principle that not only physicians, but all responsible officials of corporations employing physicians or otherwise engaged in the practice of group medicine should qualify, be registered, and be governed by appropriate standards of medical ethics and business management.

MEDICAL CARE FOR 15,000 WORKERS AND THEIR FAMILIES. A SURVEY OF THE ENDICOTT JOHNSON WORKERS MEDICAL SERVICE: 1928. *N. Carpenter. Abstract of Publication No. 5, Committee on Costs of Medical Care, Sept., 1930, pp. 17.*

This abstract presents the observations of Mr. Carpenter and the other investigators under four main headings: history and description; financial aspects; comparison with community medical facilities; and summary and conclusions.

1. History and Description.—The Endicott Johnson Company is one of the world's largest makers of shoes and tanners of leather. The Corporation inaugurated its medical activities to meet the requirements of the workmen's compensation laws. The medical service was organized as a branch of the Workers' Medical and Relief Service and is administered by a nonmedical executive responsible directly to the administrative heads of the Corporation. The service, including outside facilities, covers a wide range of specialties, even providing obstetrical care. Several branches of service are maintained, one at each of the main plants of the company.

By the year 1928 the service had expanded to a volume of activities represented by 87,400 home calls by physicians and 118,740 office visits to physicians within the year. The total staff of more than 100 included twenty-eight physicians and sixty-seven trained nurses.

2. Financial Aspects.—The budget for 1928 was nearly $900,000. This figure includes complete costs of the service, thus making possible direct comparison with the costs of unorganized private practice. The service was used by 35,181 workers and dependents potentially eligible, making the cost per capita for those using it $25.49.

3. Comparison with Community Medical Facilities.—The surveyors found that patients covered by the Endicott services usually called a physician more often and earlier than those cared for by private practitioners. The Endicott Johnson patients were hospitalized more frequently and consulted specialists more often. There was, however, no significant difference with regard to duration of illness in each group.

The comparative study of the two groups of physicians revealed no conspicuous difference in training, internship, or postgraduate study; inquiry into methods of practice seemed to favor first one group and then the other. Physicians of the Corporation group were found to be receiving moderate but substantial incomes; those of the community group receive in some cases relatively low and in others much higher incomes than any of the Corporation physicians.

Dr. Foster summarizes his impressions of the medical aspects of the work as follows: "My general impression of the medical work in the Endicott Johnson organization is that it is good. The actual treatment of disease is favorably comparable with that in the district and probably with that of general practice in any small city. In some respects, notably relating to preventive medicine and obstetrics it is probably superior to that of the smaller cities generally, and certainly far better than that in such cities among the working classes."

Dr. Hooker says concerning the quality of surgical service: "It appears that the work of the Endicott Johnson surgeons compares very favorably with that of surgeons in other communities of the same size and probably in some respects excels it."

Dr. Davis says from the administrative point of view: "The general organization of the hospitals and clinics associated with the Endicott Johnson Medical Service is somewhat above the level usually found in non-teaching institutions in communities of this size. There are evident defects, the correction of which is less a matter of finance than of sound planning and execution."

4. Summary and Conclusions.— From their studies the surveyors derive such conclusions as the following:

The continued existence of a medical service with the scope and magnitude of the Endicott Johnson service constitutes a noteworthy economic and social phenomenon.

Such an enterprise could scarcely have persisted for ten years on so secure a foundation without the confidence and good will of four elements in the community: its own professional and technical staff, its patients, the medical profession, and its financial sponsors.

The data suggest that a medical service so organized that there is no charge to the patient for each specific item promotes a substantially wider use of medical facilities than would otherwise be the case.

The evidence from this survey and from the reports of the special observers points to the conclusion that the relation of the Endicott Johnson physician to the patient is a free and personal one, similar to that found in good private practice. The observers likewise agree as to the general good standing of the service.

The Endicott Johnson Workers Medical Service is a practical demonstration of the possibility of establishing an elaborate community health service closely integrated with existing facilities for the care and prevention of illness. More than this, it would seem that there are ways in which the existence of a large-scale medical service may have been of benefit to the entire community.

The comparison of services rendered by medical organizations and by private practitioners requires more extensive and detailed information on matters of cost and adequacy. It is anticipated that studies now in progress or planned under the auspices of the Committee on the Costs of Medical Care will provide this information.

—H. W. S.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

WORKERS' ECZEMA AND INSURANCE. *M. Ganzoni. Abstr. as follows from Schweiz. med. Wchnschr., Nov. 23, 1929, pp. 1169–1175, in Bull. Hyg., Oct., 1930, vol. 5, pp. 765–766.*

In Switzerland a list of substances believed to cause eczema was drawn up many years ago. If eczema is certified as due to one of these substances compensation is paid, and if not, it is re-

garded as an ordinary disease for which the insurance sick pay is only half that of compensation. The author considers that the list should be revised and calls attention to the advantage of the English system, under which compensation is paid for dermatitis caused by dust or liquids during work. Many materials, such as cement or lubricating oils, may cause eczema and yet not contain an ingredient which is on the Swiss list. The employer is hardly likely to be interested in a change which may add considerably to his expenses. It is for lawyers, doctors, and technicians to work together in close contact, so that suitable prophylactic measures may be taken and compensation paid to all genuine occupapational cases.—A. J. C.

ACCIDENTAL HERNIAS AND THEIR COMPENSATION. *E. St. Jacques. Canadian Med. Assn. Jour., May, 1930, vol. 22, pp. 661–663.*

The author of this paper proposes, in the light of clinical evidence and operative experience with hernias of all varieties, to lay down some definite rules for guidance "in this maze of more or less contradictory opinions." In the interest of precision and conciseness as means of clarifying hernia problems he excludes consideration of embryologic and anatomic aspects of the question. He then sums up what he regards as the practical considerations under four headings, as follows:

1. Terminology should clearly differentiate, among accidental hernias, first the traumatic or those resulting from direct blows, and secondly the effort hernias or those developing under stress or work.

2. Factors determining diagnosis of an accidental hernia should be (*a*) sudden intense pain forcing cessation of work; (*b*) appearance of a lump not before apparent; (*c*) local tenderness on examination.

3. Exceptional hernias of partially accidental character such as scrotal hernia, omental hernia, and hernia accompanied by undescended or ectopic testicle demonstrated after alleged injury should never be regarded as entirely the result of recent injury.

4. Compensation should be awarded according to the following scale:

Accidental Hernia.—An injured worker who accepts operation should merit free treatment, or full pay from the date of the injury until ten weeks from the date of the operation, plus 5 per cent. partial permanent disability compensation; and he should be allowed fifteen days in which to make his decision.

A healthy worker who refuses operation should be allowed 10 per cent. partial permanent disability compensation.

A worker unfit for operative treatment should be allowed 15 per cent. partial permanent disability compensation.

Aggravated Hernia.—A worker who accepts operation should be awarded free treatment, or full pay from the date of the injury until ten weeks from the date of the operation; and fifteen days should be allowed him to decide.

A worker whose health precludes operation should be granted 5 per cent. partial permanent disability compensation for the aggravation of the preexisting disability.

A healthy worker who refuses operation merits no compensation whatever. —H. W. S.

THE CLASSIFICATION OF SILICOSIS AS AN OCCUPATIONAL DISEASE ENTITLED TO COMPENSATION. *E. Saupe. Klin. Wchnschr., 1930, vol. 9, pp. 1352–1356.*

TRAUMATIC SYPHILIS. *M. Torlais. Bull. Soc. franç. de dermat. et syph., Nov., 1930, pp. 1202–1203.*

A sailor, aged 57, hurt his leg by a fall from a ladder eight days previously. At the site of the injury, on the inner, upper part of the left leg, a sore had developed, the size of a haricot bean. Under antiseptic treatment, in a month's time the ulcer was as big as a 5-franc piece. A Wassermann test taken at this time proved to be strongly positive, and specific treatment rapidly brought about a cure. After verifying the facts of the accident and the knowledge of the Wassermann findings, the insurance company accepted responsibility for the accident. —R. P. W.

INDUSTRIAL MORTALITY AND MORBIDITY STATISTICS

SICKNESS AMONGST OPERATIVES IN LANCASHIRE COTTON SPINNING MILLS (WITH SPECIAL REFERENCE TO THE CARDROOM). *A. B. Hill. Indust. Health Res. Board, Rep. No. 59, pp. 81. H. M. Stationery Office, 1930.*

Twenty years ago, men exposed to the dust arising during the carding of of raw cotton used to suffer from a characteristic occupational asthma. Localized exhaust appliances were then introduced to remove dust generated at the dusty process of stripping the carding engines. Great improvement followed, but the operatives maintain that injurious dust and fiber are still to be found in the mills, and that they suffer in consequence. The present report gives details of a statistical inquiry into sickness records undertaken to investigate the matter. The author has tackled the difficulties inherent in such an investigation with great skill. By the methods used, which are described in detail, he has established the presence of an excessive amount of respiratory sickness among workers exposed to dust as compared with other workers in the same mills. This excess, however, was not present till age 30 and later; those under that age showed no excess. The employers claim these figures as proof of the value of the exhaust appliances in use; but the operatives point out that from ten to fifteen years of exposure are required before the dust would so damage the lungs as to originate an excessive amount of respiratory sickness. They also point to the women in the same room as the carding engines, who do not carry out the stripping; they suffer, though to a less extent than the men, and must be affected by dust and fiber floating across the large workplaces.

While the exact problem under investigation has not been definitely solved, the inquiry has certainly established that by investigating sickness records, the presence of a particular form of sickness among a group of workers exposed to some special hazard can be determined.—E. L. C.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

LESIONS OF THE NERVOUS SYSTEM OF DOGS IN EXPERIMENTAL LEAD POISONING. *E. K. Ewserowa. Abstr. as follows from Arch. f. Psychiat. u. Nervenkrankh., 1929, vol. 88, p. 752, in Arch. Neurol. and Psychiat., Dec., 1930, vol. 24, pp. 1263–1264.*

The author reports observations on experiments with five dogs. Lead was administered in the form of lead acetate, either mixed with the food or in the form of pills. The observations reported include those of a clinical nature as well as histologic examinations postmortem. Clinically, the effect showed itself in: (1) Psychic changes such as excitement, irritability alternating with apathy, and marked weakness. In some of the dogs a definite change in behavior was noted throughout the experiment. (2) In four dogs there were convulsions of a generalized nature, but in the fifth they were typical of cortical irritation. (3) Paralysis of the limbs and ataxia. (4) Emaciation, exhaustion, and at times definite cachexia.

The duration of life following the beginning of the administration of the lead varied from thirty-two to 224 days. The duration of life, as well as the degree and extent of symptoms, had no apparent relation to the amount of lead administered. The histologic changes can be classified under two headings: (1) a diffuse degenerative process in the visceral

and somatic centers of the brain and spinal cord with special predilection for localization either in the deep cortical layers or in the tuber cinereum, and (2) cell proliferation of the walls of the blood vessels and the formation of foci in them. In one case a definite focus was found in the nerve tissue.

The author is of the opinion that the psychic manifestations, the convulsions, the paresis, and the ataxia were directly due to the diffuse degenerative processes in the brain, especially in the cortex. The metabolic changes, the exhaustion, and the cachexia were probably associated with the lesions in the nuclei of the tuber. This, however, could not be considered as the only cause of these phenomena. In reviewing the literature, the author finds that the histologic changes observed in these experiments did not correspond entirely with those in the case of cats described by other authors. The most important deviations noted were the absence of ameboid neuroglial reactions and the occurrence of proliferative changes in the blood vessels.

A Criticism of Recent Work on the Presence of Lead in the Egg of the Domestic Hen. *H. B. Taylor. Med. Jour. Australia, May 24, 1930, vol. 1, pp. 675–679.*

The results given in this paper for the lead content of eggs obtained from various sources show that the amount of lead in an egg from a fowl which has been fed on ordinary food giving a lead intake of approximately 0.5 mg. per day, does not exceed 0.005 mg.

A slight increase in this amount can be obtained by feeding a fowl on lead, but the increase is extremely small when compared with the amount of lead it is necessary for the fowl to ingest.

The lead content of a number of eggs has been determined by the method of Bishop (see This Jour., 1928 and 1929, Abstr. Section) and the errors in the method which gave rise to the high values found have been pointed out.

Determinations have also been made by the method of Bishop, modified so as to eliminate the errors mentioned, and the results then obtained agreed very closely with those obtained by my method.

Bishop and Cooksey in "An Additional Note" (see This Jour., 1930, vol. 12, Abstr. Section, p. 93) confirm the results of Bishop by a new method originally introduced by me. Since the errors in Bishop's analyses have been pointed out, it is obvious that errors must also exist in the new method as applied by Bishop and Cooksey to confirm the results of Bishop.

It would appear, therefore, highly probable that the high values for the lead contents of ordinary eggs given by Bishop and later confirmed by Bishop and Cooksey are due to the means employed to determine them.—*Author's Summary.*

Mercury Vapor Unit Operates Successfully at South Meadow. *J. Orr. Abstr. as follows from Power, 1930, vol. 72, pp. 4–9, in Chem. Abstr., Oct. 20, 1930, vol. 24, p. 5086.*

Mercury vapor at 880°F. is used. The condenser is also a boiler, generating steam. *Selenium sulphide* paper exposed to flue gases is used to detect leakage. Special precautions are used regarding health of workers. Some

workers in the early stages of the plant development had symptoms of poisoning, but there was no serious case. The performance of the plant over a four-months' period is described.—P. D.

TOXIC EFFECTS OF METHYL CHLORIDE GAS. *B. B. Sharp. Abstr. as follows from Brit. Med. Jour., Feb. 22, 1930, vol. 1, p. 336, in Chem. Abstr., July 20, 1930, vol. 24, p. 3559.*

The clinical findings in a case of methyl chloride gas poisoning are described.—P. D.

POISONING BY NITROUS FUMES GIVEN OFF WHEN CERTAIN EXPLOSIVES ARE USED IN MINES. *C. Simonin and R. Stauder. Méd. du travail, 1930, vol. 2, pp. 343–347.*

The question is discussed of the occurrence of poisoning by nitrous oxide fumes arising from explosives used in mines. The matter came under attention when a shot firer in a mine succumbed from what seems certainly to have been acute bronchopneumonia set up by nitrous fumes. High explosives are said to give off small amounts of these fumes when fired, but hardly enough to cause poisoning. The author seems not to know that occasionally when shots are fired a cartridge may burn off and not explode; when this happens, nitrous fumes are extensively formed. Poisoning from this cause is a well-recognized danger in mines.—E. L. C.

A SIMPLIFIED MODEL OF HALDANE'S APPARATUS FOR THE DETERMINATION OF OXYGEN AND CARBON DIOXIDE IN AIR. *M. E. Marschak. Abstr. as follows from Jour. Physiol., 1930, vol. 68, pp. xiv–xvi, in Bull. Hyg., Nov., 1930, vol. 5, p. 862.*

This model appears to simplify the standard Haldane apparatus satisfactorily, by reducing the number of taps from four to two.

The separate taps which it eliminates are those which, in the Haldane model, connect the absorption vessels with: (*a*) the burette, and (*b*) the outer air. Instead of them there is a neat three-way tap which connects the burette with either of the absorption vessels or with the outer air. This central tap is conveniently placed, and thus enables the carbon dioxide absorption vessel and the thermobarometric tube to be placed on one side of it while the oxygen absorption vessel is located on the other.

Another special feature of this modification is that whereby the junctions of the tubes of the central-tap piece with the tubes of the absorption vessels are secured by rubber tubing sealed with mercury—thus effectually preventing leakage.—P. S. L.

DETERMINATION OF SMALL CONCENTRATIONS OF SULPHUR DIOXIDE AND HYDROGEN SULPHIDE PRESENT TOGETHER IN AIR. *V. G. Gurevich. Abstr. as follows from Jour. Russ. Phys.-Chem. Soc., 1930, vol. 62, pp. 111–119, in Chem. Abstr., Nov. 10, 1930, vol. 24, pp. 5254–5255.*

A neutral 5 per cent. potassium chlorate solution converts sulphur dioxide present in air into sulphuric acid quantitatively; under the same conditions not more than 4 per cent. of hydrogen sulphide present in the same air undergoes oxidation. Hydrogen sulphide is oxidized to sulphuric acid by hydrogen peroxide solution con-

tained in a second wash bottle. By passing a known quantity of air through these two solutions, sulphur dioxide and hydrogen sulphide at concentrations, respectively, of 0.017 to 0.6 mg. and 0.092 to 0.6 mg. per liter can be evaluated with satisfactory accuracy by determining the sulphuric acid formed.—P. D.

INJURIES FROM URSOL IN THE FUR INDUSTRY. *R. L. Mayer and M. Förster. Abstr. as follows from Zentralbl. f. Gewerbehyg., June, 1929, N. S. vol. 6, pp. 171–178, in Bull. Hyg., July, 1930, vol. 5, p. 571.*

Ursol is the commercial name given to metaphenylenediamine and is regarded as a frequent cause of dermatitis. The authors emphasize the importance of functional tests applied to the skin in addition to mere reliance on the family and occupational history. If such testing is applied, the number of cases alleged to be due to ursol falls considerably. The diagnosis "ursol poisoning" from the history is no more to be relied on than a diagnosis of lead poisoning from the presence of punctate basophilia.

Altogether 181 persons employed in the fur trade were examined, of whom 111 in the course of their work had suffered from dermatitis or asthma. Of these 111, 45 per cent. showed existence of eczema and 38.7 of asthma; a combination of the two was found in 16.2 per cent. On testing their skins with a small piece of 2 per cent. paraphenylenediamine vaseline, 44.1 per cent. showed hypersensitization to ursol. Forty-six per cent. of those with eczema gave positive reactions, 30.2 of the asthmatics, and 72.2 per cent. of those who showed presence of both conditions.

The authors regard 44.1 per cent. as directly due to ursol and 55.8 per cent. doubtfully so. The general question of sensitization of the skin is then discussed in particular relation to ursol.—T. M. L.

DUST HAZARDS AND THEIR EFFECTS

COAL-MINER'S LUNG. AN INVESTIGATION INTO THE ANTHRACOTIC LUNGS OF COAL-MINERS IN SOUTH WALES. *S. L. Cummins and A. F. Sladden. Jour. Path. and Bacteriol., 1930, vol. 33, pp. 1095–1132.*

This study of the black lung of coal miners is unusually thorough. It is based on an examination of lungs from thirty-eight cases, many of whom died accidentally. In addition to the pathologic examination, analysis of thirty-four of the lungs was carried out. Details of these analyses are given, and form the most extensive series of such analyses yet published. Eleven excellent illustrations are given of the macroscopic and microscopic conditions seen. The paper opens with a useful historical résumé of earlier references to anthracosis and other forms of dust diseases. The authors hold that the blackness of coal miners' lungs is due to coal; any iron present is quite in subsidiary amounts. Frequently fibrosis is present, caused by dusts other than coal, and particularly by silica from intervening rocks. Such fibrosis blocks the lymph flow of the lungs, and coal dust collects in abundance in such lungs. Normally coal dust is fairly rapidly removed from

healthy lungs, but it may so collect in a fibrotic lung as to form a nodule of coal. At times local necrosis takes place, with cavitation quite apart from any tuberculous infection. Discharge from such cavities accounts for the black sputum of miners. Wherever the coal particles were found most concentrated, analysis showed the content of silica to be particularly high. The conclusion is reached that anthracosis is not a simple condition, but exists only as a subdivision of lung fibrosis usually due to silicosis. Probably the lungs of miners interfered with by different dusts account for the high death rates from pulmonary diseases, particularly bronchitis, among coal miners on certain fields, even though their death rate from tuberculosis is usually low. Nevertheless, a condition of anthracosis may be pronounced without interfering with the general health.—E. L. C.

Asbestos and Pulmonary Asbestosis. *V. Dhers. Méd. du travail, July, 1930, vol. 2, pp. 147–172; Sept., 1930, pp. 187–209.*

In this long article the author usefully summarizes information relating to the occurrence of occupational asbestosis. A history of the use of this mineral and its properties is given, together with its chemical composition. Then a description follows of the industrial uses to which it is put, during which dust may be generated, particularly during weaving operations. The lungs of workers become affected in direct proportion to the length of time they have been exposed to it, until after twenty years of work 80 per cent. are affected. Statistics and information as to the occurrence of lung diseases among asbestos workers in all countries, but particularly in Great Britain, are brought together. Reference is made to experimental work carried out by exposing animals to the dust, the results of which have not all been published. The lung condition is characterized by dyspnea, cough, and the presence of asbestosis bodies, possibly in the sputum, but more certainly in the lungs. These bodies are due to organic material deposited upon fine spicules of dust. The fibrosis caused is general throughout the lungs, which are so damaged as to lead to a fatal issue without any secondary infection necessarily occurring. Such fibrosed lungs may be detected by radiography; but the shadows thrown are not so coarse as those of silicosis.

Diagnosis must depend largely on a knowledge of the occupation of the worker. Prognosis generally is unfavorable, since treatment is unsatisfactory. The only thing to do is to abolish the dangers by suppressing the hazard. Efforts made to this end are summarized. The article is accompanied by a full bibliography containing fifty-six references. It ought to be a useful contribution to which anyone interested in asbestosis will turn.—E. L. C.

Pulmonary Asbestosis. A Report of a Case and a Review. *W. B. Soper. Am. Rev. Tuberc., Dec., 1930, vol. 22, pp. 571–584.*

A man of 30 years was admitted to the William Wirt Winchester Hospital, West Haven, Conn., on May 26, 1929, at which time he had been exposed to asbestos dust over a period of about thirteen years. No indications of the severity of the exposures (*i.e.*, dust

concentrations) are given. He was admitted to the hospital four months after he had stopped working.

At that time his weight was 142 pounds, or 8 pounds below his "best weight." Physical examination showed 5 cm. chest expansion, considerable dyspnea particularly on exertion, sputum occasionally blood streaked but negative for tuberculosis, occasional râles, burning pain over the whole chest, nervousness, irritability, and constipation of three months' standing. Several nontender "asbestos corns" were seen on the hands. Blood picture and urine showed nothing unusual. X-ray picture was distinctive of the cobweb appearance noted previously by Wood (see *Tubercle*, 1929, vol. 10, p. 353).

The patient was discharged on July 2, 1929 and reexamined on April 9, 1930. During the nine months' interval he had rested at home. Dyspnea had increased, the burning pain in the chest had been superseded by dull, drawing pain above the left breast, and weight had increased from 142 to 162 pounds. Respirations were 25 and "even ordinary speech produced shortness of breath"; the complexion was leaden, with noticeable cyanosis of the ears, hands, and skin on pressure; chest expansion was 1.5 cm. (as compared with 5 cm. nine months previously). Râles were considerably more definite and more widespread than nine months earlier.

Among the author's conclusions are the following:

"The most common single symptom is dyspnoea. This and the other symptoms are essentially those of a progressive generalized lung fibrosis.

"The physical signs of uncomplicated pulmonary asbestosis are substantially those of generalized fibrosis of both lungs and basal pleurisy.

"X-ray examination is of great value in establishing the diagnosis.

"Asbestos contains but a very small amount of free silica but probably conduces to a more hasty evolution of any accompanying tuberculosis, as in the better understood forms of silicosis.

"An immediate diagnosis at autopsy is said to be made possible by simply squeezing out upon a slide a drop of lung juice from the fibrosed tissue and covering with a cover-glass. The asbestosis bodies in large number are readily visible under the microscope." —P. D.

PNEUMONOCONIOSIS DUE TO FLUE DUST. *W. E. Cooke. Brit. Med. Jour., Nov. 15, 1930, vol. 2, pp. 816–817.*

Detailed analyses are given of boiler scale and flue dust, and also of dust particles found in the lungs of a man who had been a boiler cleaner for 113 months. He died from tuberculosis, while X-rays suggested advanced pneumonokoniosis. The lungs were fibrosed throughout, and dust and dust cells were found in excessive amount. Although the silicious matter in the pulmonary dust was proportionately less than in the flue dust, the occupational exposure is held to have certainly originated the pathologic condition. The process of flue cleaning is not favored; during twelve years twenty-seven men have been employed, and have given up the work. Excepting two of these, one of whom worked only one day and the other one week, the average period of employment was fifteen months, while the nearest approaching the period of the deceased man was thirty-six months.—E. L. C.

A Statistical Study of Pulmonary Changes Found among Miners Working in Rock Dust. *A. Policard and E. Martin. Bull. Acad. de méd., 1930, vol. 104, pp. 333–343.*

A clinical and radiographic examination was made of 175 men using rock drills in mines in the basin of the Loire, some being X-rayed on several occasions. As many men came for examination on account of illness, the percentage of lung trouble found cannot be held to be representative. Nevertheless, when divided according to length of work, nearly 50 per cent. were normal with less than one year of work, as compared with 25 per cent. with ten years or over of work. No information as to age is given, which might quite invalidate the findings. Two certain points emerge: one is that even ten years of exposure to mine dust does not necessarily cause pulmonary fibrosis; and the other, than an unusual number of cases of open tuberculosis were discovered. No X-ray picture diagnostic of silicosis was found; but progressive changes in the appearances were of value in detecting the silicotic condition. The authors hold pulmonary silicosis to be a particular instance of tuberculosis developing under special conditions.—E. L. C.

Some Aspects of Silicosis. *P. Heffernan. Tubercle, 1930, vol. 11, pp. 481–489.*

A discussion is presented, rather than new facts. The idea is advanced that silica may react by toughening lung tissue generally, while nodular fibrosis occurs at the site of lesions of which tuberculosis is the most common agent. Such nodules may be radiologic indicators of more extensive silicotic changes taking place, but not casting visible shadows. Silica enters into certain forms of life, and so may be expected to interact with protoplasm. The reaction may be expedited by such a medium as alkaline soap, with acute silicosis as a result; normally the reaction is a chronic process. Its development is associated with increasing dyspnea and dry pleurisy. Should tuberculosis not supervene, cardiac hypertrophy and failure ends the scene. Physical signs alone are not diagnostic; nor is a skiagram; a history of exposure to risk and symptoms must also be present. The fibrotic changes are progressive and cannot be inhibited. Coal and certain other dusts may facilitate the exit of silica; but silica has some power of bringing about the retention of dusts otherwise excreted. Prevention of the risk must be effected; it lies in keeping inhaled air free from a suspensoid system of silica-in-air, which behaves, physically, as a gas. The risk may be lessened by minimizing exposure to tuberculous infection.—E. L. C.

WOMEN AND CHILDREN IN INDUSTRY

Women in 5-and-10-Cent Stores and Limited-Price Chain Department Stores. *M. E. Pidgeon. U. S. Dept. Labor, Women's Bur., Bull. No. 76, 1930, pp. 56.*

This bulletin covers personal infor-

mation regarding the women involved, scheduled hours, and earnings in 1920 to 1925, and in 1928.

Scheduled hours were reported for 5,224 women, of whom 37.4 per cent. had a day of eight hours or less and 30.6 per cent. a day of nine hours; the remainder had a day of over eight and under nine hours. The lunch period was one hour for about 90 per cent. of the women reported. About a fourth of the women had a Saturday schedule of ten hours, more than a fifth a schedule of over ten and under twelve hours, and practically a twelfth a schedule of twelve to twelve and one-half hours. The weekly schedule of about 70 per cent. of the women was in the groups of over forty-eight and including fifty-four hours, and four-fifths of the remainder had hours longer than these.

In the states having legislation regulating hours, 3,988 women were reported. The daily, weekly, and Saturday schedules were shorter than the legal maximum for, respectively, 86.7, 70.6, and 36.6 per cent. of the women in these states. In five states in which the law restricted hours to nine daily, with a weekly limit, 67.6 per cent. of the women had daily, 62 per cent. had weekly, and 33.5 per cent. had Saturday hours shorter than the maximum permitted.

WOMEN IN FLORIDA INDUSTRIES. *U. S. Dept. Labor, Women's Bur., Bull. No. 80, 1930, pp. 113.*

This survey covered 163 establishments employing 5,956 white women and 1,888 negro women.

Natural ventilation was good in two-thirds of the hotel and restaurant workrooms, and in all but three laundries, and was satisfactory in about half the factories. Artificial ventilation was provided in all but three hotels and restaurants and in a third of the laundries. Lighting, whether natural or artificial, was satisfactory throughout the entire plant in about two-thirds of the establishments. Where this was not the case, the usual defect was insufficient natural lighting or glare in artificial lighting.

Bubblers were found in twenty-three plants but were of insanitary construction in all but nine. The common cup was in use in thirty-two establishments. Washing facilities were provided in all but eight establishments, four of which were laundries. In thirty-six no towels were supplied and in thirty-three a common towel was provided. Sufficient toilets were provided in over two-thirds of the plants, but in forty-six cases the number was insufficient.

The chief hazard was that of possible falls caused by slippery floors or obstructions in workroom aisles and by stairways that were too steep, narrow, or winding, without a handrail, or in bad repair.

Some place in which lunch could be eaten was provided in three-fifths of the 163 establishments reported, and over one-fourth had some rest room facilities, although very few had separate rest rooms. Only twenty-nine of 100 plants that reported having cloak rooms provided satisfactory equipment, such as lockers or racks. In seventy establishments, employing 1,571 women, first aid facilities were entirely lacking.

A schedule of less than nine hours was reported for nearly a third of the white women, and a schedule of nine

hours for over a third of the white women and for practically a sixth of the negro women. A schedule of ten hours or more was reported for 15.3 per cent. of the white women and over two-thirds of the negro women. A Saturday shorter than other days was the rule for nearly one-half of the white women and for a little over two-fifths of the negro women. The most common period allowed for lunch was one hour for white women and a half hour for negro women.

A Survey of Laundries and their Women Workers in 23 Cities. *E. L. Best and E. Erickson. U. S. Dept. Labor, Women's Bur., Bull. No. 78, 1930, pp. 164.*

This survey covered the hours, wages, and working conditions in laundries and the composition of the working force, including such facts as nationality, age, marital condition, and length of service. Records were made from 290 power laundries employing 24,337 workers, of whom 81.2 per cent. were women. Negro women comprised a little more than one-fourth of the women employed. Women were found in all occupations except those of collection and delivery and of engineers.

In each plant temperature readings were taken with a sling psychrometer near the flat work ironers and presses. One-fourth of the dry bulb readings were 80° and over. Of these dry bulb readings of 80° and over, one-half had wet bulb readings of 70° and over, and a little more than a fifth had a relative humidity of 60 per cent. and more. Nearly one-half of the readings were reported by the investigator as being comfortable, and about the same proportion as being warm or hot. One-half of the readings reported as comfortable were from 70° to 75° dry bulb and from 60° to 65° wet bulb. More than three-fourths of the readings described as hot had a dry bulb of 80° and over, and all had a wet bulb of 70° and over. No artificial ventilation was found in one-third of the laundries visited.

Of 214 laundries in which local exhausts and protection were provided, 11.2 per cent. had hoods with exhausts over all their flat work ironers and a number of others had some of their machines so equipped. Of the laundries reporting, over four-fifths of those with hot tumblers and one-sixth of those with drying rooms were equipped with outside exhausts.

Natural lighting was found satisfactory in half the laundries. Artificial lighting was satisfactory in more than three-fourths.

Floors throughout the entire plant were of cement in sixty and of wood in fifty of the 290 laundries.

Seats for all employees were supplied by nineteen laundries, and for some workers by 118 others.

More than half of the laundries were equipped with bubble fountains, but only twenty-seven had bubblers that were sanitary. A little over a fifth of the laundries used common drinking cups. Special washing facilities were provided in all but twenty-eight laundries. In two-fifths of the laundries toilet accommodations were insufficient in number.

First aid was provided in all but fifteen laundries, and a special person to administer it in all but fifty-eight. Special cloakrooms were found in about one-half of the laundries; in

thirty-three there was no provision for wraps. Only twenty-seven had special rest rooms; twenty-seven more had rest facilities in a cloak, lunch, or wash room. A lunch room was provided in fifty-five laundries and a gas or electric plate for the employees' use in ninety-nine others.

Seven laundries had flat work ironers without a guard, and ninety-two had extractors without guards. No guards on presses were reported in forty-four laundries. Slippery floors in departments where women worked were found in twenty-four laundries. Handrails for stairs were lacking in twenty-one plants. Stairs were in bad repair in thirty plants, and the construction of stairways was unsatisfactory, because of high risers or narrow or triangular treads, in seventy-six laundries.

In 166 laundries some presses operated with foot treadle were in use, and old-fashioned body ironers were found in a small number of plants.

The full scheduled hours were worked by 50.2 per cent. of the white and 29 per cent. of the negro women. Full time was greatest in the East and the West. Less than scheduled hours (time lost) was worked by 39.6 per cent. of the white and 52.1 per cent. of the negro women. It was greatest in the Middle West. More than scheduled hours (overtime) was worked by 10.2 per cent. of the white and 18.9 per cent. of the negro women. It was greatest in the South.

The lunch period was thirty minutes for 62.9 per cent. of the women, and one hour for 21.9 per cent. The remainder fell between. Only 2,216 women, in thirty-two plants, were allowed rest periods.

THE EMPLOYMENT OF WOMEN IN THE PINEAPPLE CANNERIES OF HAWAII. *C. Manning. U. S. Dept. Labor, Women's Bur., Bull. No. 82, 1930, pp. 28.*

The survey here reported covered the working conditions, wages, and hours of the women employed in three canneries in Honolulu and four on the island of Maui at the peak season of the industry. There were in all about 4,000 women employed, a large proportion of whom were under 20 years of age. This is due to the fact that the peak season comes during the school summer vacation.

Many of the workrooms were high, light and airy, and spotlessly clean. The one or two which seemed dark and drab would have been improved by a more generous use of white or light paint or by a rerouting of the work to eliminate the impression of confusion and overcrowding. In only one cannery was water seen standing in pools, and it was in another part of the same cannery that the only sticky floor was noted. Quite generally no effort was spared to keep the concrete floors dry and clean. Rarely was there even a scrap of fruit on the floor, and when there was a sudden overflow of sirup or fruit on the sealing machine, a janitor appeared almost immediately to clean it up.

In the majority of the plants toilet facilities measured up to the best of mainland standards. There was no lack of bubbler drinking fountains. Occasionally shower baths were included in the sanitary equipment. Some cloakrooms were furnished with metal lockers in large number; in others there was a limited number of lockers; in still others wall hooks and racks suf-

ficed. In a few canneries there were pleasant rest rooms, while in others there seemed to be nothing to answer this purpose. Even in the matter of lunch rooms the type varied from bare table and benches, with no hot food or drinks available, to modern cafeterias in shining white rooms, furnished for comfort instead of with the barest essentials, and where hot tea flowed from a large central urn as freely as water.

First aid rooms were found in a majority of the canneries visited. Some were so complete as to be like emergency hospitals. The nurses in charge did much more than care for minor cuts or illnesses; they were personnel workers in every sense of the word, mingling with the employees in the plant and keeping a watchful eye on general health conditions and sanitation.

Besides rest rooms, cafeterias, and first aid departments, some individual feature, such as housing for employees, either in dormitories or in camps, bus transportation, playgrounds, or day nurseries, characterized each firm. In one of the day nurseries efficient maids cared for the young children, following a regular program of baths, naps, and meals, the last named being supplied by the firm.

The work of the women is limited almost exclusively to the preparation of the fruit—cleaning, sorting or sizing, and packing in the cans. No women are engaged in the processing or actual cooking of the fruit, and men predominate also in the heavier jobs in the can loft, on loading platforms, and in the cooling rooms, the machine shop, and the warehouse. Machines have eliminated much of the heavy and sticky handwork in connection with the preparation of the fruit, so that nothing but the simplest kind of labor is now required of the women.

In many cases the uniforms worn by the girls at work were furnished and laundered by the firm. Everywhere the employees wore rubber gloves to protect their hands from the acid in the pineapple juice. An initial deposit of 25 cents was customary for the gloves, but after that the firm kept them in repair or replaced them with new ones when needed.

Scattered through one plant were adjustable chairs with backs, but in all canneries the nonadjustable stool or slab seat predominated. The worktables were usually of a convenient height which made it possible for the workers to change at pleasure from a standing to a sitting position. To obviate standing on hard floors, firm wooden platforms quite generally are provided. The average reach from the conveyor belt to the cans ranged from 12 to 20 inches; this did not seem excessive.

In Honolulu work normally began at 7 A.M. and continued until 5:30 P.M., with an intermission of half an hour at midday, making a ten-hour day in all. The usual schedule for a night shift was from 7 P.M. to 5 or 5:30 A.M. In Maui the day started at 6 or 6:30, closed somewhat earlier than in Honolulu, and had a longer recess for lunch. There is no legislation that limits the hours of work for women, and the ten-hour day was the customary standard. In Honolulu nine out of ten of the women worked overtime. Overtime, however, was excessive only here and there in a few individual canneries and was not characteristic of the industry as a whole.

CHILD LABOR—FACTS AND FIGURES. *U. S. Dept. Labor, Children's Bur., Pub. No. 197, 1930, pp. 133.*

The material in this bulletin presents a brief analysis of information on the following aspects of child labor: history of the movement for the prohibition and regulation; extent and distribution in the United States; causes, social cost, and prevention; present legal status in the United States; and vocational guidance and vocational education. A list of reading references is appended to the discussion in each section.

THE DOCTOR LOOKS AT CHILD LABOR. *National Child Labor Committee, Pub. No. 356, 1929, pp. 22.*

This pamphlet consists in a collection of statements from recognized medical authorities with regard to various health hazards involved in child labor. Among the subjects discussed are: chronic fatigue; hidden infection; physical unfitness; poison trades; cardiacs without symptoms; monotony; after-school work; migratory workers; and accidents.

THE SCHOOL LEAVER AND FACTORY WORK. *Abstr. as follows from Schweiz. Ztschr. f. Hyg., 1930, vol. 10, pp. 425–527, in Bull. Hyg., Jan., 1931, vol. 6, p. 16.*

Over 100 pages are given to consideration of the Swiss school child and the age for work, in a number allotted to the Social Politic Conference at Berne in May, 1930. The school leaving age varies from 13 to 15 years in different cantons. The First International Congress for Protection of Workers, held at Washington in 1919, recommended 14 years as the earliest age for factory work. This has been generally followed, save by Japan allowing 12, and India still earlier ages. The Berne Conference agreed that on both school and social grounds the age of compulsory attendance should extend to 15 years; which should also be the earliest age for industrial work. No gap is to intervene between school and work, although physiologic variation from immaturity sometimes indicates postponement till 16. A transitional institution was suggested where actual workers of experience would teach and grade children with wood and metal handicrafts, and push off the final decision as to work, as long as possible.

Prof. W. von Gonzenbach (Zurich) emphasized the necessity of minimizing the external life changes during the considerable pressure of internal change at puberty, if either physical or mental disturbance is to be avoided. Fortunately only about 10 per cent. of the 15 year olds go into the Swiss factories. Insistence on a later age is not sentimental philanthropy but biologically founded economics. Manufacturers have to insist that none under 16 are employed on certain processes.—J. K.

CHILD LABOR IN NEW JERSEY. PART 1. EMPLOYMENT OF SCHOOL CHILDREN. *N. P. McGill and M. Skinner. U. S. Dept. Labor, Children's Bur., Pub. No. 192, 1929, pp. 140.*

This is a study of the employment of school children in Newark and Paterson. In Newark 6,265 public school children under 16 years of age had worked—5,441 boys and 824 girls. Of this number, 2,434, including forty girls, had done street work, and 4,468,

including 796 girls, had done other kinds of work. In Paterson the total number of working children was 2,126—1,934 boys and 192 girls. Of this number, 596, including sixteen girls, had done street work, and 1,713—179 girls—had engaged in other occupations. The working boys were 18 per cent. of the public school enrollment under 16 years of age in Newark, and 16 per cent. in Paterson; the working girls were 3 per cent. and 2 per cent., respectively. Among children working during summer vacation 76 per cent. in Newark and 70 per cent. in Paterson worked the entire vacation, and 53 per cent. in the one city and 47 per cent. in the other had worked throughout the school session from its beginning in September to the date of interview between the following March and June.

In each city, both during vacation and during the school year, the largest number of children were employed in stores, chiefly as delivery boys and in smaller numbers as sales boys and girls and general helpers. The next largest number in any one occupation were nursemaids, and the next largest, bootblacks at indoor stands. The other children worked in factories, assisted painters, carpenters, plumbers, etc., were errand boys or office boys or girls, caddies, helpers in pool rooms and bowling alleys, janitors' assistants, and workers in lunch rooms and restaurants, and engaged in a variety of other work.

CHILDREN IN AGRICULTURE. *N. P. McGill. U. S. Dept. Labor, Children's Bur., Pub. No. 187, 1929, pp. 81.*

This bulletin summarizes the principal findings of the published reports of investigations of the work of children in agriculture made by the Children's Bureau and by other agencies. It includes studies of cotton and tobacco plantations, beet fields, grain farms, truck farms, fruit orchards and hop yards, onion fields, and cranberry bogs. One section is devoted to an outline of legal regulations, by states. The statistics are collected at the end of the bulletin.

CHILD LABOR IN AGRICULTURE AND FARM LIFE IN THE ARKANSAS VALLEY OF COLORADO. *B. H. Mautner, W. L. Abbott, H. W. Bell, and A. Bispham. National Child Labor Committee, 1929, pp. 158.*

This report, based upon studies made during the summer, fall, and winter of 1924, presents the findings under three general headings: work and work conditions; child workers and their families; and child workers and the schools.

Of 658 children who were reported as doing some work on the farm, 22.3 per cent. were from 6 to 9 years old, inclusive; 52.3 per cent. from 10 to 13 years, inclusive; and 25.4 per cent. 14 and 15. Approximately one-half of the total number worked more than sixty days; a little over one-fifth worked more than eighty days. The working day varied from 2 hours to 14.5, averaging 9 hours. The crops worked on were: beets, melons, cucumbers, hay, corn, small grains, beans, and miscellaneous.

Work in the beet fields resembled work in industry in some respects: It was highly standardized; the hours were long; and there were rush periods. Colorado law does not, however, recognize this similarity. The other

CHILD LABOR—FACTS AND FIGURES. *U. S. Dept. Labor, Children's Bur., Pub. No. 197, 1930, pp. 133.*

The material in this bulletin presents a brief analysis of information on the following aspects of child labor: history of the movement for the prohibition and regulation; extent and distribution in the United States; causes, social cost, and prevention; present legal status in the United States; and vocational guidance and vocational education. A list of reading references is appended to the discussion in each section.

THE DOCTOR LOOKS AT CHILD LABOR. *National Child Labor Committee, Pub. No. 356, 1929, pp. 22.*

This pamphlet consists in a collection of statements from recognized medical authorities with regard to various health hazards involved in child labor. Among the subjects discussed are: chronic fatigue; hidden infection; physical unfitness; poison trades; cardiacs without symptoms; monotony; after-school work; migratory workers; and accidents.

THE SCHOOL LEAVER AND FACTORY WORK. *Abstr. as follows from Schweiz. Ztschr. f. Hyg., 1930, vol. 10, pp. 425–527, in Bull. Hyg., Jan., 1931, vol. 6, p. 16.*

Over 100 pages are given to consideration of the Swiss school child and the age for work, in a number allotted to the Social Politic Conference at Berne in May, 1930. The school leaving age varies from 13 to 15 years in different cantons. The First International Congress for Protection of Workers, held at Washington in 1919, recommended 14 years as the earliest age for factory work. This has been generally followed, save by Japan allowing 12, and India still earlier ages. The Berne Conference agreed that on both school and social grounds the age of compulsory attendance should extend to 15 years; which should also be the earliest age for industrial work. No gap is to intervene between school and work, although physiologic variation from immaturity sometimes indicates postponement till 16. A transitional institution was suggested where actual workers of experience would teach and grade children with wood and metal handicrafts, and push off the final decision as to work, as long as possible.

Prof. W. von Gonzenbach (Zurich) emphasized the necessity of minimizing the external life changes during the considerable pressure of internal change at puberty, if either physical or mental disturbance is to be avoided. Fortunately only about 10 per cent. of the 15 year olds go into the Swiss factories. Insistence on a later age is not sentimental philanthropy but biologically founded economics. Manufacturers have to insist that none under 16 are employed on certain processes.—J. K.

CHILD LABOR IN NEW JERSEY. PART 1. EMPLOYMENT OF SCHOOL CHILDREN. *N. P. McGill and M. Skinner. U. S. Dept. Labor, Children's Bur., Pub. No. 192, 1929, pp. 140.*

This is a study of the employment of school children in Newark and Paterson. In Newark 6,265 public school children under 16 years of age had worked—5,441 boys and 824 girls. Of this number, 2,434, including forty girls, had done street work, and 4,468,

including 796 girls, had done other kinds of work. In Paterson the total number of working children was 2,126—1,934 boys and 192 girls. Of this number, 596, including sixteen girls, had done street work, and 1,713—179 girls—had engaged in other occupations. The working boys were 18 per cent. of the public school enrollment under 16 years of age in Newark, and 16 per cent. in Paterson; the working girls were 3 per cent. and 2 per cent., respectively. Among children working during summer vacation 76 per cent. in Newark and 70 per cent. in Paterson worked the entire vacation, and 53 per cent. in the one city and 47 per cent. in the other had worked throughout the school session from its beginning in September to the date of interview between the following March and June.

In each city, both during vacation and during the school year, the largest number of children were employed in stores, chiefly as delivery boys and in smaller numbers as sales boys and girls and general helpers. The next largest number in any one occupation were nursemaids, and the next largest, bootblacks at indoor stands. The other children worked in factories, assisted painters, carpenters, plumbers, etc., were errand boys or office boys or girls, caddies, helpers in pool rooms and bowling alleys, janitors' assistants, and workers in lunch rooms and restaurants, and engaged in a variety of other work.

CHILDREN IN AGRICULTURE. *N. P. McGill. U. S. Dept. Labor, Children's Bur., Pub. No. 187, 1929, pp. 81.*

This bulletin summarizes the principal findings of the published reports of investigations of the work of children in agriculture made by the Children's Bureau and by other agencies. It includes studies of cotton and tobacco plantations, beet fields, grain farms, truck farms, fruit orchards and hop yards, onion fields, and cranberry bogs. One section is devoted to an outline of legal regulations, by states. The statistics are collected at the end of the bulletin.

CHILD LABOR IN AGRICULTURE AND FARM LIFE IN THE ARKANSAS VALLEY OF COLORADO. *B. H. Mautner, W. L. Abbott, H. W. Bell, and A. Bispham. National Child Labor Committee, 1929, pp. 158.*

This report, based upon studies made during the summer, fall, and winter of 1924, presents the findings under three general headings: work and work conditions; child workers and their families; and child workers and the schools.

Of 658 children who were reported as doing some work on the farm, 22.3 per cent. were from 6 to 9 years old, inclusive; 52.3 per cent. from 10 to 13 years, inclusive; and 25.4 per cent. 14 and 15. Approximately one-half of the total number worked more than sixty days; a little over one-fifth worked more than eighty days. The working day varied from 2 hours to 14.5, averaging 9 hours. The crops worked on were: beets, melons, cucumbers, hay, corn, small grains, beans, and miscellaneous.

Work in the beet fields resembled work in industry in some respects: It was highly standardized; the hours were long; and there were rush periods. Colorado law does not, however, recognize this similarity. The other

crops showed these features of industrialization to a less degree, but the hours of work were long for the greater proportion of the children.

CHILD WORKERS ON CITY STREETS. *N. P. McGill. U. S. Dept. Labor, Children's Bur., Pub. No. 188, 1928, pp. 74.*

A summary is given of the findings in published reports regarding newspaper sellers, newspaper carriers, peddlers, bootblacks, magazine carriers and sellers, and miscellaneous street workers. The various state laws and ordinances regulating the work of children in street trades are given in brief.

INDUSTRIAL ENVIRONMENTAL CONDITIONS

THE MEASUREMENT OF SKIN TEMPERATURE IN ITS RELATION TO THE SENSATION OF COMFORT. *E. F. Ward. Am. Jour. Hyg., July, 1930, vol. 12, pp. 130–154.*

In these interesting experiments, Miss Ward found a definite relationship between skin temperature and the sensation of comfort experienced by individuals under various atmospheric conditions. The highest correlation coefficients recorded were those between sensations of comfort and skin temperatures of the carotid and forehead. The least correlation was shown by the sternum.

Disregarding individual variations, sensations of maximum comfort were experienced when the temperature of the forehead and carotid were between 33° and 34°C. Uncomfortable sensations of cold were induced when the temperature at these points fell to between 31° and 32°C. Sensations of warmth, on the other hand, were associated with skin temperatures of 35° to 36°C.

Excellent correlations are shown between skin temperatures at various points and effective temperature, as well as between skin temperatures and dry kata cooling power. It is claimed that the effects observed are due chiefly to changes in the dry bulb temperature of the air since there was but little variation in humidity and almost no perceptible air movement in the experimental room.

It would be interesting to repeat these experiments with various percentages of relative humidity in order to determine any probable humidity effect not disclosed in the present study.—C. P. Y.

THE ATMOSPHERIC CONDITIONS IN PITHEAD BATHS. *H. M. Vernon, T. Bedford, and C. G. Warner. Indust. Health Res. Board, Rep. No. 60, 1930, pp. 29. H. M. Stationery Office, 1930.*

In 1928 bathing facilities were available for less than 4 per cent. of all the coal miners in Great Britain, but now the rate of erection of baths is much more rapid, as the Miners' Welfare Fund receives a substantial contribution from mining royalties, which is applied to the provision of baths. The design of the baths erected up to 1928 was based on typical continental installations, in which all the clothes, both clean and dirty, were suspended over the heads of the men; but the new baths have separate sections for pit

clothes and for clean clothes, and each miner has a clothes locker in each section. After coming up from the pit, the miner leaves his pit clothes in his pit clothes locker, proceeds to the bathing cubicles, and after having a shower bath, passes to the clean clothes section.

In order to compare the atmospheric conditions in the new type of bath with the old type, observations were made on the rate of drying of damp towels, which were spread over bundles of clothes. The towels were weighed at regular intervals, and it was found that their rate of drying varied in inverse proportion to the difference between the vapor tension of air saturated with moisture at the dry bulb temperature to which the towels were exposed, and the vapor tension at the observed dry and wet bulb temperatures. The rate of drying of clothes in the lockers was considerably slower (*e.g.*, two to five times slower) than in the gangway outside, owing chiefly to the poor ventilation through them, which caused moist air to collect. Also the drying might be delayed by the clothes pressing against the sides of the locker. Square lockers are therefore better than oblong ones. The ventilation of the lockers can be improved by increasing the size of the gaps near the top and bottom.

In baths with overhead suspension for clothes it is possible to get an air temperature in the "clothes drying region" which is 13°F. higher than that in the "men region" below, if gilled steam pipes (fixed 7 to 8 feet above the floor) are used for heating. It is suggested that if the double section system of baths is found to be too expensive, the single section system should be used, but with the clean clothes alone kept in lockers, the pit clothes being suspended overhead.—H. M. V.

COMPARISON BETWEEN ARTIFICIAL AND NATURAL SOLARIZATION AND STABILIZATION OF SPECIAL ULTRA-VIOLET-TRANSMITTING GLASSES COMMERCIALLY ON THE MARKET. *D. C. Stockbarger and L. B. Johnson. Jour. Franklin Inst., 1930, vol. 210, pp. 455–459.*

LIGHTING IN FACTORIES AND WORKSHOPS. *Welfare Pamphlet No. 7, pp. 25. H. M. Stationery Office, 1930. Abstr. as follows in Bull. Hyg., July, 1930, vol. 5, p. 536.*

This pamphlet summarizes in simple, nontechnical language the reports and recommendations of the Home Office Departmental Committee on Factory Lighting, and should prove most valuable to workers, employers, and factory surgeons.

The lighting essentials are stated in general terms as:

1. Adequacy re safe access and efficient work—every part of the room being sufficiently lighted to reveal obstacles and dirt, to prevent waste and accidents, and to promote good work.

2. Suitability re avoidance of flicker, glare, and extraneous shadows on the work.

For these purposes the minima are given as:

(*a*) On the working area = 0.25 foot-candle (fine work 3; very fine work 5).

(*b*) For interiors = 0.1 foot-candle (fine work 3; very fine work 5).

(*c*) For approaches = 0.05 foot-candle (fine work 3; very fine work 5).

It is noted that while excess of light may involve waste if it reveal unnecessary detail, it is common to find as much as 40 per cent. reduction of light

below maximum efficiency level—the chief causes being dirt and deterioration of sources originally adequate, but not maintained.

There is an excellent section on perception of detail by contrasts, and the pamphlet concludes with a series of very practical questions which employers may usefully ask themselves regarding the lighting of their factories.

In appendixes are given the detailed recommendations of the Departmental Committee, with illustrations of good and bad lighting.—P. S. L.

INDUSTRIAL NURSING

SOME ASPECTS OF INDUSTRIAL NURSING. *M. D. MacDermot. Canadian Pub. Health Jour., April, 1930, vol. 21, pp. 169–173.*

There is little record of the early history of industrial nursing. Any work in this direction was done privately by the employers and was successful to a certain extent, but frequently led to misunderstanding.

In 1897, probably the first organized step in industrial nursing was taken by the Cadburys, who mapped out a definite health and welfare program for their employees. Three years later, one of the large department stores in New York hired an industrial nurse to care for the health of its employees. In some instances, the nurses' salaries were paid by the employees, until gradually the employer realized that it was to his benefit to supervise their health.

There are three main points to be considered in industrial nursing: (1) the choice of nurse for this sort of work; (2) the industrial nursing program; and (3) a means by which industrial nurses can co-operate with each other.

An important factor to be considered in choosing an industrial nurse is her training. She should have some experience in public health nursing, and should be adequately familiar with the welfare and medical organizations of the city to take over such a position. She should include in her program (1) health supervision in the factory; (2) health supervision in the homes; and (3) some health supervision of the other members of employees' families. Supervising health in the factory means some knowledge of the construction and equipment of the plant. Care in the homes and advice to mothers in the care of their children should be given if necessary.

The public has become educated to the fact that the industrial nurse plays an important part in the life of the worker. The people realize that early preventive treatment is much less expensive than late curative treatment.

INDUSTRIAL NURSING SERVICE PROVIDED BY A PUBLIC HEALTH NURSING ASSOCIATION. *E. Kowalke. Pub. Health Nurse, Dec., 1930, vol. 22, pp. 615–617.*

The author describes the industrial nursing service provided by the Milwaukee Visiting Nurse Association since 1909, and outlines its advantages for the employer and the nurse, as well as for the Association.

The contract made with the companies is on a yearly basis and provides

that service may be terminated by either party on a written notice of thirty days, and also that the Association protect the nurse while on duty, with a liability insurance. The full time nurses make their headquarters at the plant. Whenever they feel the need for a visit to the home of an employee, the case is referred to the Visiting Nurse Association headquarters, and the call is assigned to a nurse working in the district where the patient lives. The district nurse makes her report direct to the plant nurse. In plants where the physical hazards are not great and where a small number of persons are employed, the nurses find it possible to arrange a schedule for definite hours in the plant and a schedule for visiting in the homes of the employees.

The industrial nurse submits a monthly report of her activities to the Association; the case records of the employees are, of course, filed in the plant and are considered plant property.

NURSES IN COMMERCE AND INDUSTRY. *L. M. Tattershall. Pub. Health Nurse, March, 1930, vol. 22, pp. 147–148; April, 1930, pp. 194–195; Nov., 1930, pp. 572–575; Dec., 1930, pp. 633–637.*

This report is not a census of nurses employed in industry but merely a study of them. It is concerned mostly with the kinds of industries which employ nurses, the number employed, their status, and the nature of their services in the plant. In December, 1928, a questionnaire was sent out to 2,200 establishments in which nurses were employed. Nearly one-half of these sent in their replies. Seven main classes of industrial concerns are represented, but 88 per cent. of the establishments are manufacturing concerns. A total of 2,022 nurses are employed by the 1,006 establishments which sent in reports—189 men and 1,833 women. Most of these are employed for full time. The average number of employees per nurse is 963.

Ninety-one per cent. of the establishments studied employ physicians, who are either on a part time or a full time basis, or just on call. Most of the full time physicians are in the larger establishments, and those on call, in the smaller ones.

Ninety-one per cent. of the female nurses and only 25 per cent. of the male nurses are registered. Eighty-five per cent. of the total number of nurses included in the report are registered nurses; only 5 per cent. of the total number of establishments reporting employ practical nurses. Most of the male nurses are in industries which employ very few women, such as the steel and iron industries.

In 68 per cent. of the establishments, the nurse is professionally responsible to a physician; this covers 77 per cent. of the total number of nurses. This does not necessarily mean that a physician is employed in the plant. Less than one-third of these nurses have written standing orders from the physician.

Of the total number of nurses included in the report, 1,250 are on inside duty only, that is, 58 per cent. of the female nurses and 95 per cent. of the male nurses; 28 per cent. do both inside and outside work; and 10 per cent. do only outside visiting.

The services of the nurses are classified under three headings: establish-

ment, home, and miscellaneous. Most of their services are in connection with first aid treatment of injuries and illness, and subsequent treatment. Most of their outside work includes follow-up of absentee employees in their homes. In some cases care is given to their families as well. The industrial nurse works, on the average, 48.8 hours a week, which is longer than the ordinary public health nurse's week.

POLICIES AND PROBLEMS OF PUBLIC HEALTH NURSING. *Pub. Health Nurse, Jan., 1930, vol. 22, pp. 45–47; April, 1930, pp. 221–222.*

This article consists of questions sent in to the National Organization for Public Health Nursing by industrial nurses, and of answers to these questions obtained from experienced leaders in the industrial field.

1. In a factory which has no plant physician the duty of the industrial nurse toward employees who have cases of diphtheria in their homes is to consult the health officer. Care should be taken lest the disease be transmitted to other workmen, with whom the employee comes in contact, and their families. A culture of his throat should be taken before he is permitted to return to work.

2. According to one physician, a man running a cafeteria in a plant, independently employed and not considered one of the employees of the plant, should be examined by the medical department of the plant. Another states that the manager or owner of the cafeteria should be responsible. Still another says that the city department controlling the work should take care of the physical examination of the man.

3. A nurse rather than a clerk should make follow-up visits to employees who are absent from work because of illness. One nurse, however, feels that some one outside of the medical department should make follow-up visits in order to avoid any feeling on the part of the employee that the factory is checking up on his absence from work.

4. An industrial nurse can educate the employees in good health habits in numerous ways, aside from her contact with them in the plant. She can investigate conditions under which people are working, conditions in their homes, and give advice as to hygiene, ventilation, clothing, diet, etc.

5. For the most part, the industry should pay for one or two professional magazines for the nurse's use. They are as essential a part of the nurse's equipment as chemical publications are of the laboratory. Some nurses, however, pay for their own magazines, and do not expect the factory to supply them.

6. An industrial nurse can aid in the safety program by group talks to employees, by teaching physical fitness, and by seeing that aisles and stairs are clear and well lighted, and that there is good ventilation, proper temperature, all possible elimination of dust, and sufficient illumination.

7. A nurse may supervise the dining room or cafeteria in a plant if her duties as a nurse do not require her full time.

An industrial nurse has to be somewhat of a diplomat: she has to please the patient, the doctor, and the employer. An important part of her work is the keeping of proper records.

J. I. H.
March, 1931

These should be open only to the doctor and the nurse and not to any employer to read at will.

PRACTICAL SUGGESTIONS FOR NURSES IN INDUSTRY. *W. J. McConnell. Pub. Health Nurse, Oct., 1930, vol. 22, pp. 509–512.*

Dr. McConnell warns graduate nurses who may be attracted by the shorter hours in industry not to enter industrial work unless they possess health, patience, a sense of humor, an abundance of tact, and ability to cooperate cheerfully with plant personnel and workmen of varying nationalities. He outlines the qualifications and duties expected of an industrial nurse and gives helpful suggestions regarding the treatment of wounds, supplies, the dispensary, and record keeping.

BIBLIOGRAPHY FOR INDUSTRIAL NURSES. *Pub. Health Nurse, Oct., 1930, vol. 22, p. 548.*

RECORD KEEPING AND THE INDUSTRIAL NURSE. *M. Page. Pub. Health Nurse, June, 1930, vol. 22, pp. 323–326.*

Simple and accurate records are an important part of an industrial nurse's work. At the Richardson Company in Cincinnati, Ohio, a daily record is kept for all calls and new industrial accidents, including minor injuries. The employee's name is noted as well as the department, injury, cause, treatment, and the doctor, if medical care is needed. Records of redressings and of new calls of miscellaneous nature are also kept, such as questionable claims of industrial accidents and reports of disability necessitating loss of time. Copies of each day's report are sent to all department heads in order that they may be constantly reminded of the importance of safety.

Record cards are kept for each individual, on which are shown data concerning his physical examination and industrial accidents. Records of compensable cases are kept on blue cards, others on white. Reports are sent to the management every month, and every six months a full report is made, summarizing the monthly reports. For the annual report, the frequency and severity accident rate is computed and comparisons are made with the accident records of other years. A copy of the monthly report sheet is included.

THE INDUSTRIAL NURSE AND FATIGUE. *E. P. Osborne. Pub. Health Nurse, Nov., 1930, vol. 22, pp. 555–557.*

Miss Osborne approaches the study of fatigue from a strictly human basis and considers chiefly mental fatigue. Mental fatigue is caused by worry—real or imaginary. Happiness and contentment depend on the ability to discard this imaginary worry and to find a cure for the real one or the ability to adjust oneself to it. It is here that there is an opportunity for the industrial nurse. With sympathetic understanding she can encourage the worker to unburden his mind and often can help him to remove the cause of a real worry. No hard and fast rules can be set down to be applied to the human study. Every individual is unique and must be approached by a technic which fits his particular case. The best method is that of "listening." Illustrative cases are cited.

INDUSTRIAL PSYCHOLOGY AND INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS

VOCATIONAL SELECTION OF TELEPHONISTS. *J. Goossens. Abstr. as follows from Bruxelles-méd., 1930, vol. 10, pp. 629–639, in Bull. Hyg., July, 1930, vol. 5, p. 572.*

Stress is first laid on the need for vocational selection, which reduces to a scientific method haphazard habits of engagement. It is possible because of the great diversity in human beings and the demands of occupations. Vocational selection, apart from being a financial gain both to employer and to employee, has, in addition, social and economic aspects. In selecting telephonists various qualities and aptitudes are needed. Physically the workers should be of average height, with normal sight and vision; they should speak correctly and have a strong back; digestion and breathing should both be normal. With regard to special senses, preference should be given to hearing and sight, and particularly to a hearing memory for numbers. A sense of space and capacity for sustained attention is needed, and also a short time reaction; while an equable temperament is requisite on account of being kept in constant touch with the public.

Some description is given of the various methods used to detect the presence of these characteristics, by the method of either Münsterberg, or Fontègne and Solari, or Klütke, or Giese, or finally of the Michigan Bell Telephone Company. The tests used by each are mentioned; but no method is perfect. Whatever method is used the test should not take long nor be complicated; even medical examination should be superficial rather than profound, although sufficient to detect obvious disabilities. Properly carried out selection for telephonists improves the public service and lessens time lost for various reasons, particularly for health. Up to the present the matter has not received such attention in Belgium as in Anglo-Saxon and Teutonic countries, but the author thinks it is never too late to mend.—E. L. C.

ON THE MINIMUM VISUAL ACUITY OF CHAUFFEURS AND ON THE ADMISSIBILITY OF THE USE OF CORRECTIVE GLASSES WHEN DRIVING AN AUTOMOBILE. *D. Kantor. Abstr. as follows from Russk. opht. jur., June, 1930, vol. 9, pp. 760–766, in Am. Jour. Ophth., Dec., 1930, vol. 13, pp. 1134–1135.*

According to the government regulations of 1929 in Soviet Russia, a qualified chauffeur must have a visual acuity of not less than 0.75 in each eye. The author discusses the visual standards established for automobile drivers in Germany and Italy, as well as the corresponding French and Belgian projects of Jeandely and Weeker. He concludes that the total visual acuity of both eyes for safe driving should be not less than 1.4, with a minimum of 0.5 in the weaker eye. In the presence of any diseased condition affecting the visual acuity, the visual acuity must subsequently be tested every three months. Persons who need a correction of the refractive error in order to qualify for a driver's license must be, when driving, in the possession of an additional pair of glasses for emergency purposes.

J. I. H.
March, 1931

INDUSTRIAL MORTALITY AND MORBIDITY STATISTICS

OCCUPATIONAL MORTALITY AS INDICATED IN LIFE-INSURANCE RECORDS FOR THE YEARS 1915–1926. *R. H. Britten. Reprinted from U. S. Pub. Health Rep., May 30, 1930, vol. 45, pp. 1250–1259.*

So important is a recent investigation into occupational mortality in this country[1] that a special analysis of the published report has been made from the point of view of the industrial hygienist, and the results are given in this paper. The original investigation was made jointly by the Actuarial Society of America and the Association of Life Insurance Medical Directors, and the occupational data involved 1,300,000 entrants and 22,600 deaths, during the years 1915 to 1926, for twelve insurance companies. For certain occupations where the only known hazard was that of accident, the data were limited to the years 1920 to 1926. Since policies issued only during these periods were considered, it is evident that the cumulative effect of industrial hazards is more or less lost, and that the chief value of the material for the industrial hygienist will lie in its accurate picture of the accident hazard in specific occupations and in its measure of the effect of economic and social differences upon occupational mortality.

The paucity of data in regard to occupational mortality in this country makes this report of unique interest; but it also has a valuable advantage over official mortality data by occupation, in that the information as to the number exposed to risk and the number of deaths is based on the same source, namely, the individual policy. As is well known, the fundamental weakness of official occupational mortality data lies in the fact that the information as to the population depends on the occupational census and the information as to the deaths on the death certificates (with the doctor's statement as to occupation). In life insurance data the deaths are checked off against the original policies. We know that, at the time of issuance of the policy, the man was employed in the occupation to which his death is actually assigned. Change of occupation will still offer a difficulty, but in view of the relatively short period covered in this study, this does not appear to be a particularly disturbing factor. In connection with this point it should be noted that when an individual transferred from one occupation to another, the exposure was terminated upon reduction in the rating either from a substandard to a standard policy or from a higher to a lower extra premium for a hazardous occupation. Thus, generally speaking, there will not be in these data any great tendency to ascribe to a given occupation deaths actually due to the hazards of another occupation.

No policies were in operation for more than twelve years for the 1915 to 1926 data, or for more than seven years for the 1920 to 1926 data. Of

[1] Joint Occupation Study: 1928. Compiled and published by the Actuarial Society of America and the Association of Life Insurance Medical Directors. New York, 1929. (Chairman of Joint Committee, Arthur Hunter, to whom grateful acknowledgment is made for review of the present paper.)

course, in many cases the workers had been employed for much longer periods in the specified occupations, but it is known that they were able to pass the usual life insurance physical examination sometime during the period covered by the study. Therefore, one will not expect the data to be comparable with official mortality rates according to occupation, which reflect long exposure to specific industrial hazards. In connection with this point it is well to quote the following statement from the joint report:

> Previous investigations in this subject have led actuaries to expect at least two distinct types of extra mortality—one with a fairly constant extra during the working years of life, and the other with increasing additional cost to middle life or beyond. Locomotive firemen exemplify the first and saloon keepers the second type. In each of these classes the mortality ratio is affected by the duration of the experience. A less usual type is that where the extra mortality decreases with duration. In the present investigation the average duration is distinctly shorter than the average life of a policy on the books of the companies. Accordingly, for the first type of hazard, like locomotive firemen, those years are emphasized in which accidents are heaviest as a percentage of the mortality, and the ratios of actual to expected mortality are too high. For the second type, like saloon keepers, the emphasis is placed upon the period of lowest extra cost, and their ratios are understated in an experience of short duration.

The fact that all persons considered had passed life insurance physical examinations is, of course, a point of great importance that the reader will not overlook.

The method of study limited the value of the material from the point of view of age, as data as to specific causes were secured for only two broad age groups, 15 to 39, 40 and over. For all causes, however, it has been possible to adjust the rates on the basis of a five-year age group. The ages used in the report are those at time of issuance of the policy; but except for certain specific points this proved not to be an important factor.

All twelve of the companies cooperating in the study gave all of their substandard data (*i.e.*, where the premium asked was higher than normal), but two gave none of their standard data, and two gave but one-fifth of it coming within the required occupational classes. The correction devised in the course of that investigation has been included in the figures used in this paper without further comment. The effect of this correction was, obviously, to reduce the mortality rates in certain occupations.

The only policies included in the study were those under which life insurance would have been issued at the standard rate of premium if it had not been for the occupation. Thus, all policies were omitted which would have been classed as substandard because of build, race, residence, or medical impairment. Only ordinary business was included.

Both men and women were included, but in most occupational groups the men naturally predominated.

In the Joint Report the method has usually been to present the ratio of actual to expected deaths for a given number of years a policy had been in force and for a given age at issuance. The expected deaths were taken from tables of basic rates for 1915 to 1926 and for 1920 to 1926, these tables having been prepared on the basis of the investigation itself, rather than on

the basis of previous standards. In this analysis, because of the familiarity of industrial hygienists with mortality rates, it has been found preferable to convert the ratios of actual to expected deaths into death rates. In doing so, it is of particular importance to note that these death rates are automatically adjusted both for age and for the length of time the policies had been in force.

The difference in the age distribution of this group of policyholders and that of the total population, however, is a point that must be kept in mind. Figure 1 presents the curves representing the percentage of persons in each age group, for the actuarial data, for a group of 10,000 industrial workers studied by the United States Public Health Service, for occupied males (1920 census), and for the total population of the country (15 years of age and over). It is noted that the life insurance group are concentrated in the ages from 25 to 45—ages when the risk of accidental death is especially high and the risk of death from most diseases very low.

It must be noted that the age distribution of the various occupations is by no means the same. For instance, farm laborers have 78 per cent. under 30 years of age; janitors, 21 per cent. Table 1 presents the percentage in each of four broad age groups.[2] The occupations are ranked according to the percentage in the age group 15 to 29. Ages are those at entry, but this is of no moment from a relative point of view. The table is limited to occupations having 25,000 or more population.

[2] According to age at issuance—clearly an insignificant factor in the use of broad age groups.

From the point of view of safety engineers and others interested in accident prevention in industry, the most valuable feature of the report is the possibility of obtaining from it the death rate from occupational accidents in a large number of specific occupations. A point previously mentioned must be stressed here: The data have

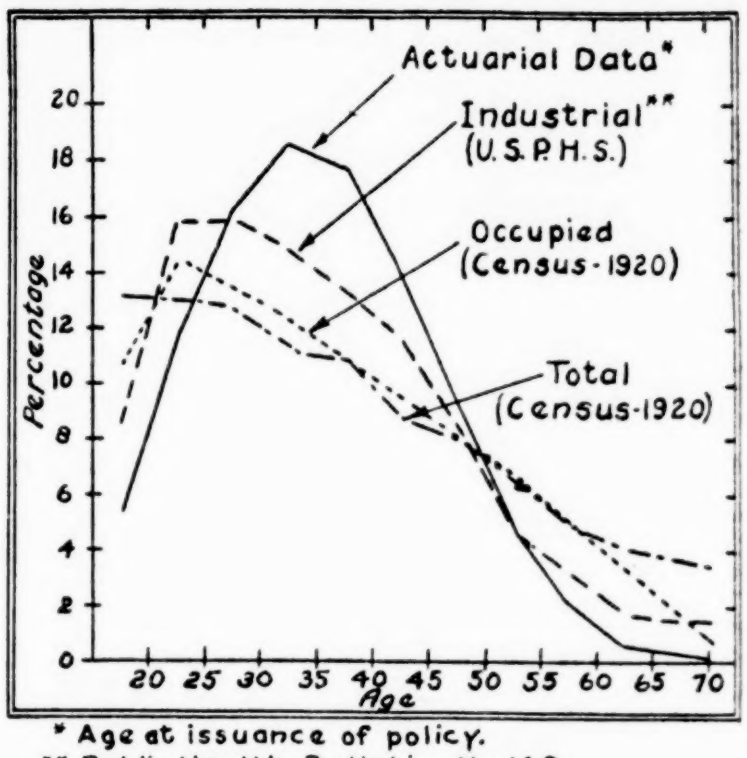

FIG. 1.—Percentage of persons in each age group.

the unique value of having both the population and the death records obtained from a single source, so that the occupation ascribed to the man at the time of his death is very likely to have been the occupation at the time when the policy was taken out and, furthermore, the classification will be identical in both cases. Table 2, therefore, which gives the death rates per thousand for occupational accidents in specific occupations, is a very concrete and relatively accurate picture of occupational accidents in this country since 1915. The rates are given without adjustment as the data

TABLE 1.—PROPORTION OF PERSONS IN EACH AGE GROUP BY OCCUPATION[1] AND AGE AT ENTRY

OCCUPATION	PERCENTAGE			
	15 to 29	30 to 39	40 to 49	50 and Over
Farm laborers	78.5	14.1	5.8	1.5
Delivery men for bakeries, etc., auto	71.6	22.0	5.4	1.1
Chauffeurs, truck (not delivery men)	70.9	23.4	5.1	0.7
Unskilled operatives in coal mines (underground)	69.1	21.9	7.0	2.0
Auto and garage mechanics	67.1	26.9	5.3	0.7
Skilled and semiskilled operatives in cotton mills	63.3	23.6	10.3	2.8
Delivery men for bakeries, etc., horse[2]	63.0	26.0	8.5	2.5
Electricians not elsewhere classified	61.5	28.4	8.8	1.3
Compositors, electrotypers, linotypers, pressmen	60.0	25.4	11.2	3.4
Semiskilled operatives in clothing manufacture (not hats)	59.4	28.6	10.1	1.9
Waiters in hotels, restaurants, and clubs (no liquor served)	58.4	31.6	8.6	1.3
Machinists not elsewhere classified	57.1	29.0	11.0	3.0
Cranemen, derrick men, and hoist men	56.7	32.9	8.9	1.4
Semiskilled fur workers	56.4	30.4	10.9	2.2
Chauffeurs, private family	55.9	34.0	8.7	1.3
Mechanics not elsewhere classified	55.8	30.7	10.5	3.0
Bakers	55.1	31.1	11.0	2.8
Draymen, teamsters, and expressmen	53.9	29.8	12.6	3.7
Rollers or roll hands in iron and steel mills	53.4	33.6	11.0	2.0
Oil and gas field foremen and miscellaneous operatives	50.6	34.7	12.1	2.6
Auto demonstrators	49.8	37.6	10.8	1.8
Semiskilled operatives in iron and steel works	47.6	32.0	15.9	4.5
Semiskilled operatives in car and railroad shops	47.2	32.6	15.9	4.4
Operatives in coal mines, underground[2]	44.8	37.2	14.8	3.1
Drug and medicine dealers, including druggists, etc.	43.0	35.3	16.9	4.8
Cooks, hotel and domestic	43.0	40.2	14.0	2.8
Tailors	42.1	36.8	16.6	4.4
Firemen, fire departments	40.3	39.1	16.0	4.5
Molders, founders, and casters of iron and steel	39.8	39.2	16.9	4.0
Painters and varnishers, house	39.1	37.9	18.1	4.9
Garage proprietors, not driving[2]	38.5	44.0	14.6	3.0
Farmers	36.8	32.1	22.0	9.1
Carpenters	36.7	36.0	20.6	6.8
Policemen, including motor cycle and state enlisted	31.0	42.8	20.4	5.7
Blacksmiths not elsewhere classified	30.5	39.9	21.8	7.8
Keepers of hotels, etc., not at bar	24.7	39.7	26.1	9.5
Undertakers	24.0	35.0	26.9	14.1
Officials and mining engineers in mines, and ore dressing and concentrating mills	21.2	43.8	26.5	8.5
Janitors and sextons	21.0	34.5	27.9	16.6
Other[2] builders and building contractors in general construction	15.3	42.4	30.9	11.4
Inspecting and supervising builders and building contractors in general construction	13.3	43.1	30.7	12.9

[1] Occupations with 25,000 or more persons.

[2] And not specified.

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were not in such a form that an adjustment by age could be made. The figure for all accidents is included at the right.

It is quite evident that there is a large group of occupations in this country at the present time subject to a severe accident hazard. The relative risk in the different industrial groups is brought out clearly in the table. The hazard is most marked among linemen and cable splicers in electric light and power plants, oil and gas field rig builders and handlers of explosives, skilled coal miners (underground), and iron mine operatives (underground). But in running down the list one finds a large number of occupations where the occupational accidents must form an important part of the total mortality in the group.[3]

Although it has been emphasized that data of this character are quite incapable of representing the mortality "with increasing additional cost to middle life or beyond," as it is put in the Joint Report, it was of great interest to determine whether differences in the mortality by occupation would be found to be expressive of economic or social levels. It was first necessary to eliminate accidental deaths, occupational or otherwise, from the comparison. This was a phase of the investigation which did not concern the Joint Committee, since they were interested in establishing ratios for the total mortality, on the basis of which the various occupations could be rated, but from the point of view of the industrial hygienist it is necessary to separate accidents from the other causes of death. The tables in the Joint Report were in such form that this could easily be done, and in Table 3 are given the death rates per thousand for each occupation with 25,000 or more persons, exclusive of accidents, occupational and nonoccupational. As before indicated, these rates are adjusted for age and for the number of years the policy had been in force, but it must be kept in mind that the age distribution to which the adjustment has been made is that of the life insurance data as a whole, not of the general population of the United States. We would not expect, therefore, to find mortality rates nearly so high as those of the country generally, even aside from the question of selection due to the physical examination.

Interpretation of the relative rates in this table is quite difficult. High rates are found for unskilled and not specified operatives in coal mines (underground), keepers of hotels, semiskilled operatives in iron and steel works; and on the other hand, low rates were found for builders and contractors, electricians, and farmers. But a close inspection of the table indicates many inconsistencies, such as a high mortality level for undertakers and policemen, and a low mortality level for delivery men (auto), semiskilled fur workers, etc. The data do not appear to be capable of further analysis in regard to mortality. The failure to obtain any clear-cut distinctions in different economic or social levels may

[3] Insufficient data are available as yet with respect to aviators. In the light of the accident mortality rates given in this table, however, it is of interest to quote the statement of Dr. L. I. Dublin that "the fatal accident rate for full-time pilots is now estimated at anywhere from 25 to 50 deaths per 1,000 annually. . . . . It has become clear that the hazard to passengers taking an occasional flight is negligible." ("The Job and the Life Span," *Harpers' Monthly Magazine*, Jan., 1930.)

TABLE 2.—DEATH RATES FOR OCCUPATIONAL ACCIDENTS, BY SPECIFIC OCCUPATION

OCCUPATION	DEATH RATE PER 1,000	
	Occupational Accidents	All Accidents
Linemen and cable splicers in electric light and power plants	5.19	5.89
Oil and gas field rig builders and handlers of explosives	5.00	6.07
Skilled coal miners (underground)	4.85	5.75
Iron mine operatives (underground)	3.35	4.39
Other structural ironworkers not elsewhere classified	2.89	4.16
Not specified operatives in coal mines (underground)	2.76	3.45
Freight (and not specified) train brakemen	2.72	3.74
Safety engineers and government mine inspectors	2.63	2.79
Brattice men, etc., in coal mines (underground)	2.47	2.93
Unskilled operatives in coal mines (underground)	2.18	2.66
Foremen in mines, etc. (underground)	1.87	2.31
Mine machinists and mechanics (underground)	1.68	1.94
Freight (and not specified) train conductors	1.66	2.27
Switchmen and flagmen	1.61	2.21
Telegraph and telephone foremen and linemen (not climbing poles or not specified)	1.58	2.12
Longshoremen, stevedores, and freight handlers	1.51	2.12
Constables, marshals, and sheriffs who arrest	1.47	2.58
Officers on ocean, Great Lakes, river and harbor craft	1.43	1.87
Forestry (not owners, engineers, or firemen)	1.41	2.06
Locomotive engineers	1.36	1.82
Copper mine operatives (underground)	1.35	2.84
Coal mine operatives (not underground)	1.30	1.80
Working window cleaners	1.29	2.00
Fishermen	1.26	2.66
Pole climbers in telephone and telegraph construction and operation	1.24	2.15
Mine stationary engineers and hoist men, etc. (not underground)	1.16	1.59
Mechanics in steel mills	1.11	1.97
Locomotive firemen	1.07	1.80
Surface operatives in mines other than coal	1.03	1.71
Quarry operatives (not handling explosives)	1.03	1.62
Car repairers in roundhouse, track, and yard	0.93	1.21
Electricians in electric light and power plants	0.92	1.48
Officials and mining engineers in mines, and ore dressing and concentrating mills	0.90	1.97
Policemen (including motor cycle and state enlisted)	0.88	1.39
Certain other operatives in electric light and power plants	0.84	1.54
Mine stationary engineers and hoist men, etc. (underground)	0.79	1.25
Laborers in iron and steel works	0.76	1.79
Yard foremen and inspectors	0.76	1.17
Furnacemen, puddlers, etc., in iron and steel works	0.74	1.23
Firemen (fire departments)	0.74	1.40
Oil and gas field foremen and miscellaneous operatives	0.72	1.48
Mine machinists and mechanics (not underground)	0.68	1.25
Electricians not elsewhere classified	0.67	1.16
Semiskilled operatives in certain chemical trades (acid, fertilizer, glue, white lead, etc.)	0.65	1.30

TABLE 2.—*Concluded*

OCCUPATION	DEATH RATE PER 1,000	
	Occupational Accidents	All Accidents
Army officers	0.65	1.05
Section and track laborers	0.58	1.22
Workers in petroleum refineries	0.54	1.44
Carriage riders, doggers, block setters, and other skilled operatives in saw and planing mills	0.50	1.30
Cranemen, derrick men, and hoist men	0.49	0.90
Miscellaneous laborers	0.48	1.70
Conductors and guards on street and interurban railroads	0.46	0.98
Auto delivery men for bakeries, etc	0.38	1.19
Truck chauffeurs (not delivery men)	0.33	0.77
Rollers and roll hands in iron and steel mills	0.31	0.84
Carpenters	0.30	0.85
Draymen, teamsters, and expressmen	0.29	0.89
Other and not specified builders and building contractors in general construction	0.27	0.85
Brick and stone masons	0.26	0.91
Semiskilled operatives in iron and steel works	0.26	0.76
Farmers	0.23	0.84
Auto and garage mechanics	0.23	0.93
Garage proprietors not driving or not specified	0.21	0.71
Farm laborers	0.19	0.92
Mechanics not elsewhere classified	0.19	0.74
Semiskilled operatives in car and railroad shops	0.19	0.71
Molders, founders, and casters of iron and steel	0.17	0.73
Auto demonstrators	0.17	0.75
Machinists not elsewhere classified	0.14	0.76
Painters and varnishers (house)	0.13	0.62

be due to an extent to the factor of selection present in all life insurance data.

In this connection, however, the following quotation in regard to laborers may be taken from the Joint Report (p. 52):

> The unfavorable mortality among laborers constitutes a distinct feature of this report. In all cases accidents were significantly high as a cause of death. . . . . Tuberculosis was most severe among those working indoors, in steel mills and foundries, and about normal among the laborers on railroad sections and on city streets. Pneumonia was above the average in every group, while the only other cause significantly serious was heart disease among the section hands.

That a certain difference associated with social or economic levels does exist was shown by a special analysis. In so far as possible, specific occupations were combined into four groups and the adjusted death rates obtained for each group. These are given in Table 4.

The semiskilled and unskilled have definitely higher mortality rates than the professional (and semiprofessional) and the skilled.

TABLE 3.—DEATH RATES, ALL CAUSES EXCEPT ACCIDENTS, ADJUSTED FOR AGE AND NUMBER OF YEARS POLICY HAD BEEN IN FORCE

OCCUPATION	DEATH RATE PER 1,000	AVERAGE AGE AT ENTRY
Not specified operatives in coal mines (underground)	5.46	36
Molders, founders, and casters of iron and steel	4.59	35
Cranemen, derrick men, and hoist men	4.48	31
Undertakers	4.40	42
Policemen, including motor cycle and state enlisted	4.39	38
Keepers of hotels, etc., not at bar	4.08	41
Officials and mining engineers in mines, and ore dressing and concentrating mills	3.91	40
Semiskilled operatives in iron and steel works	3.79	37
Unskilled operatives in coal mines (underground)	3.76	30
Painters and varnishers, house	3.65	38
Draymen, teamsters, and expressmen	3.64	34
Mechanics not elsewhere classified	3.61	34
Waiters in hotels, restaurants, and clubs (no liquor served)	3.49	30
Cooks, hotel and domestic	3.39	32
Janitors and sextons	3.34	44
Semiskilled operatives in car and railroad shops	3.33	36
Delivery men for bakeries, etc., horse[1]	3.29	32
Skilled and semiskilled operatives in cotton mills	3.28	34
Drug and medicine dealers, including druggists, etc	3.25	37
Firemen, fire departments	3.25	36
Semiskilled operatives in clothing manufacture (not hats)	3.25	33
Auto demonstrators	3.19	32
Machinists not elsewhere classified	3.11	34
Bakers	3.08	31
Garage proprietors, not driving[1]	3.02	35
Other and not specified builders and building contractors in general construction	3.01	42
Chauffeurs, private family	2.99	30
Compositors, electrotypers, linotypers, pressmen	2.98	33
Farm laborers	2.96	28
Oil and gas field foremen and miscellaneous operatives	2.93	32
Carpenters	2.93	38
Rollers and roll hands in iron and steel mills	2.87	31
Semiskilled fur workers	2.81	34
Chauffeurs, truck (not delivery men)	2.81	30
Farmers	2.57	40
Electricians not elsewhere classified	2.42	31
Delivery men for bakeries, etc., auto	2.39	29
Auto and garage mechanics	2.27	28
Inspecting and supervising builders and building contractors in general construction	2.21	42

[1] And not specified.

The form in which the data were collected, although suitable for the purpose of the investigation itself, made any very detailed comparison as to causes of death impossible. Data were obtained for two broad age groups

(15 to 39 and 40 and over). In preference to presenting a table of the rates by cause in the various occupations in these two age groups, there is given at this point a quotation from the Joint Report itself bearing on the causes of mortality in the various occupations:

TABLE 4.—DEATH RATES FROM ALL CAUSES, EXCLUSIVE OF ACCIDENTS,[1] ADJUSTED FOR AGE AND NUMBER OF YEARS POLICY HAD BEEN IN FORCE: BY SOCIAL CLASSES

OCCUPATIONAL CLASS	DEATH RATE PER 1,000
Professional and semiprofessional	3.27
Skilled	3.67
Semiskilled	4.53
Unskilled[2]	4.77

[1] Accidents were deducted, but this had to be done on actual, not adjusted, basis.
[2] Farm laborers excluded.

Tuberculosis of the lungs stands high in 25 classes, and these are chiefly among the groups of unskilled labor and the lower social strata. This tendency has been emphasized by other investigators, particularly in connection with the report for England and Wales (1921–1923). Tuberculosis is three times as heavy at each age group among unskilled laborers as it is among the upper and middle classes of society. This consideration may explain the presence of high tuberculosis rates among farm laborers, general laborers, hucksters, and freight elevator tenders. Dust is an important factor in connection with tuberculosis. Examples of dust hazard are found among miners of copper, gold, or silver, stonecutters, workers in sawmills, chippers of metal and other skilled metal workers, molders in brass and bronze, carders and combers of cotton, and upholsterers. It has been suggested that alcoholism may have an influence on the tuberculosis rate, and this report shows a high mortality from tuberculosis among hotel keepers, waiters, and cooks in hotels, restaurants, and clubs, indicating that the suggestion has some foundation. The mortality from this cause was low among farmers and druggists.

Pneumonia appears of importance in 17 classes, the principal factor in which is exposure to abnormal temperatures. Thus, there are included seven underground mining classes, as well as rollers, roll hands, and laborers in steel mills. Inclement weather conditions may lead to high death rates from this cause among chauffeurs, and alcoholism among actors and saloon keepers. Social class seems to have little importance in regard to pneumonia.

Bright's disease or chronic nephritis was significant in 10 classes, and cerebral hemorrhage or apoplexy in 5 classes. It may be mentioned that four of the latter are in the same occupations as the former, namely, the group of underground coal miners, buyers and shippers of livestock, guards, watchmen, doorkeepers, and hotel keepers. Bright's disease was also important among section foremen, locomotive engineers, motormen, proprietors driving their own express wagons, and policemen. Heart disease—which some investigators have found to be correlated with both Bright's disease and cerebral hemorrhage—appears as a significant cause in eight occupations of this investigation, and five of these have already been mentioned in reference to these two other causes of death. The remaining three employments were tailors, undertakers, and janitors.

Cancer as a cause of death has given rise to much speculation in recent years. Efforts have been made to show that it is most prevalent among those exposed to (*a*) coal-tar preparations, especially soft coal, (*b*) products of decomposition of living matter, (*c*) chemical fumes, (*d*) metallic

dusts and fumes, (*e*) certain food and drink conditions, (*f*) alcoholism. The 10 employments showing a high death rate from cancer in the present research are railroad section foremen, janitors, junk and rag dealers, blacksmiths, workers in nonalcoholic beverages, hotel keepers, freight elevator tenders, tailors and semi-skilled clothing workers and guards, watchmen and doorkeepers. Those last mentioned have had in many cases some other principal occupation before becoming guards, watchmen, and doorkeepers as a method of partial retirement from active service.

Appendicitis was prominent in the following classes: Farmers, mine officials, mine foremen underground, druggists, and policemen. In the case of farmers and those attached to mines, the difficulty of obtaining adequate medical and surgical attention for this acute disease has been suggested as a reason for the high death rate from appendicitis.

Cirrhosis of the liver was significantly high among bartenders and saloon keepers, and also among the large group of underground coal miners. It showed a low rate among farmers. This cause is well known to be closely related to alcoholism.

The purpose of the joint investigation of the Actuarial Society and the Association of Life Insurance Medical Directors was to furnish information on the basis of which the ratings of insurance companies for specific occupations could be revised. It is not possible in this review to summarize these recommended ratings. Reference is made therefore to the supplementary report of the Joint Committee[4] based on this and other investigations. The report gives suggested ratings for total insurance and also for accidental death benefits for a large number of specific occupations.

[4] Occupational Mortality Ratings. Compiled and published by the Actuarial Society of America and the Association of Life Insurance Medical Directors. New York, Dec., 1929.

METHODS OF INVESTIGATING AND OF IMPROVING THE HEALTH OF INDUSTRIAL WORKERS. *H. M. Vernon. Jour. Roy. San. Inst., 1930, vol. 51, pp. 211–216.*

The author points to the value of mortality records for studying the health of industrial workers. He shows that males in London suffer more from phthisis than do males in rural districts. Nevertheless, certain groups of clerks employed indoors suffer not more than do farmers. In contrast, low grade clerks experience two to three times as great a phthisis mortality, owing possibly to lower scales of pay and inferior nutrition; but overcrowding and deficient ventilation in offices may also be important. Overcrowding probably explains a high phthisis death rate in such industries as tailoring, bootmaking, and printing, in which no definite occupational hazard exists. Such a hazard is present in certain industries where silica dust is generated. The existence of this particular hazard was brought to light by mortality statistics, from which the particular damage caused by fine silica particles when inhaled was deduced. These records, however, also indicate that some dusts may inhibit the action of silica dust, while others may accentuate it. Mule spinners' cancer is quoted as a disease disclosed by clinical observation, the prevalence of which was subsequently detected by intensive analysis of mortality records. The difficulties associated with analyzing sickness rates are dealt with. So far, digestive troubles among weavers have thereby been noted; but progress

in this direction must of necessity be slow.—E. L. C.

METHODS OF INVESTIGATING AND OF IMPROVING THE HEALTH OF INDUSTRIAL WORKERS. *M. Culpin. Jour. Roy. San. Inst., 1930, vol. 51, pp. 217–221.*

Analysis of sickness statistics provides fruitful opportunities for drawing erroneous conclusions. The diagnoses of sickness should be carefully examined. Thus, cases grouped as nervous debility will be found to vary considerably, and to account for variations in sickness rates in different establishments. Wherever an attempt is made to eradicate such nervous troubles, sickness rates often are low. This group includes occupational neuroses, such as telegraphists' cramp, miners' nystagmus, and traumatic neurasthenia, all of which are mental phenomena rather than physical disabilities. Interesting cases are quoted, of a patient with an injured back, and of a clerk, and a laundry worker who were neurasthenics. Such persons may carry on industrially as long as they avoid special stress; but compensation causes in such people a minor psychosis to masquerade as physical disease, to the great detriment of the sufferer.—E. L. C.

PHYSICAL IMPAIRMENTS AND OCCUPATIONAL CLASS. *E. Sydenstricker and R. H. Britten. U. S. Pub. Health Rep., Aug. 22, 1930, vol. 45, pp. 1927–1962.*

The groups used for the comparison were (*a*) agricultural; (*b*) professional; (*c*) business; and (*d*) skilled trade. The age distribution of these four groups was practically identical, so that the rates of impairments for all ages could be used rather generally in the comparison.

Since the examinations were of persons who had carried life insurance and had accepted the offer of insurance companies for free health examinations, it would be expected that the lower social levels would not be adequately represented, and therefore, that the differences found would be a minimum expression of the relationship.

In spite of this fact, the general impression left by the various comparisons was a definitely higher rate, on the average, in the skilled trade group. The make-up of this group is of some interest. Of the 16,714 persons analyzed, 3,409 were classified as machinists; 1,985, carpenters; 1,577, tailors; 1,256, printers; 1,235, electricians; 998, plumbers; 836, chauffeurs; 834, barbers; 829, painters; 712, butchers; and 3,043 others. These are groups of persons where we would normally expect a somewhat higher rate of mortality than among professional persons. It is a point of great interest that the same tendency can be shown to exist in records of physical examinations. The skilled trade group stands out distinctly from the others considered. Its rates of impairments are excessively high for eye and ear conditions, teeth defects, heart and pulse, and many miscellaneous impairments. Possibly the only condition which showed a significantly low rate for the skilled trade group was that of corrected defective vision, a reflection of less care of the eyes.

For most conditions, the agricultural group would seem to have rates definitely below the average for all examined, but there are important excep-

tions, notably for teeth, stomach, and abdominal conditions, and the genito-urinary system. The rates are low for diseases of the eye and ear, nose and throat, heart and pulse, blood vessels, and many miscellaneous conditions.

The professional group conforms more nearly to the average for the entire population considered. Few conditions are found to have excessive rates, but, on the other hand, there are not very many with particularly low rates.

The business group approximates the average for the entire population considered in nearly every respect. A study of three subdivisions of this group (namely, executives, merchants, builders, etc.; salesmen; and clerks, including clerks in stores) brought out the same tendencies as in the group as a whole. There were no significant differences, once allowance had been made for natural differences in age in these three subdivisions.

Generally speaking, the characteristic age curves of specific impairments were reflected in the four broad occupational groups.

The study is one of a series being made in co-operation with the Milbank Memorial Fund, based on medical examinations conducted by the Life Extension Institute.

J. I. H.
March, 1931

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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GENERAL

THE INDUSTRIAL PHYSICIAN AND THE GENERAL PRACTITIONER. *C. O. Sappington and N. D. Marbaker. Jour. Am. Med. Assn., Dec. 27, 1930, vol. 95, pp. 1955–1957.*

This article reviews briefly the development of industrial hygiene in the United States, discusses the ideal relation between the industrial physician and the general practitioner, outlines the objectives of industrial health practice, and makes a plea for a wider expression of the objectives and problems of industrial medicine, through medical school curricula, hospitals and clinics, state and city departments of health, medical associations, and official medical publications.—K. R. D.

DANGERS TO HEALTH IN THE IRON INDUSTRY. *W. Pfannenstiel. Abstr. as follows from Zentralbl. f. Gewerbehyg., July, 1930, N. S. vol. 7, pp. 198–203; Aug., 1930, pp. 224–228, in Bull. Hyg., Jan., 1931, vol. 6, p. 27.*

This is an address given at a conference at Bochum organized by the Research Department of Industrial Hygiene of the University of Münster and the German Association for Fac-

tory Hygiene, which issues the *Zentralblatt für Gewerbehygiene*. It belongs to that class of paper of which several have appeared which might well be collected and published in book form on "occupational risks in various industries."

There is nothing new in it, but all and sundry dangers—especially carbon monoxide poisoning, accidents, iron rollers' cataract, lead poisoning (from the smelting of ores containing a small percentage), dust in sandblasting, noise, etc.—find a place.—T. M. L.

HYGIENE OF PRINTING WORKS. *C. F. Gandolfo and A. Zwanck. Abstr. from Semana méd., 1930, vol. 37, pp. 792–815, in Bull. Hyg., Dec., 1930, vol. 5, p. 923.*

This is an important paper, but nearly a third of it deals with lead poisoning in general and its symptoms, which are known to all medical officers of health. The authors' investigations were threefold: clinical examination of operatives for signs of plumbism, the chances of lead poisoning occurring among the workers, and an analysis of the environmental conditions. Eighty-three observations were carried out in five printing establishments, but, in regard to the first point, no cases of poisoning, either acute or chronic, were found. To determine the second point, investigations were made as to: (1) the amount of volatile lead in the air above the crucibles; (2) the amount at the level of the face of the worker; and (3) the amount in the atmospheric dust and the amount deposited on the printing cases. Three types of machine were in use: monotype, linotype, and typograph. The air over the crucibles of the last yielded most, but none gave more than 1 mg. in 4 cu. m. of air. At 15 cm. above monotype crucibles heated to 390°C., the amount was 0.8 mg. per 4 cu. m. of air; of linotype crucibles heated to 280°C., 0.44 mg.; of typograph crucibles heated to 245°C., 1 mg. Laboratory experiment of heating it to 500°C. raised the quantity to 1.4 mg. At the level of the worker's face the amount was only 0.4 mg. so that the concentration regarded in Germany as the limit tolerable, 1 mg., was never reached. The dust deposited on the cases contained 6.8 per cent. of lead.

In regard to the environmental conditions, the method of ventilation was a combined plenum and vacuum system, the dry kata registered 6 or thereabouts, the wet kata 18, conditions which are favorable for industrial work and at the same time cause a movement of the air sufficient to dilute the small amount of lead it contained. The paper terminates with some remarks on the local laws and regulations.—H. H. S.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

BASOPHILIC SUBSTANCE OF ERYTHROCYTE. *L. S. P. Davidson. Abstr. as follows from Edinburgh Med. Jour., Aug., 1930, vol. 37, p. 425, in Jour. Am. Med. Assn., Sept. 13, 1930, vol. 95, p. 827.*

As the result of his extensive research in this field, Davidson concludes that the basophilic substance of immature erythrocytes is the remnants of the protoplasm present in the nucleated stage. Along with hemoglobin it exists diffusely distributed in the colloidal contents of the cell. It is, therefore, invisible in the fresh untreated erythrocyte. The basophilic material becomes visible after staining, and the appearances of polychromasia, punctate basophilia, or reticulation are produced depending on a variety of factors: (1) the amount of basophilic substance present in the cell; (2) the type and concentration of the dye used; (3) factors causing fixation of the cell contents; (4) the presence or absence of laking; and (5) the degree of thickness of the cell membrane.—C. K. D.

INCIDENCE OF SICKLE-CELL TRAIT IN INDUSTRIAL WORKERS. *G. M. Brandau. Abstr. as follows from Am. Jour. Med. Sc., Dec., 1930, vol. 180, p. 813, in Jour. Am. Med. Assn., Jan. 10, 1931, vol. 96, p. 141.*

Brandau found that the percentage of occurrence of the sickle-cell trait in 150 negro men applying for work was 6.67 per cent.—C. K. D.

CHANGES IN THE RED BLOOD PICTURE FOLLOWING INDUSTRIAL DUST INHALATION IN ANIMAL EXPERIMENTS. *B. Scharlau. Arch. f. Hyg., Sept., 1929, vol. 102, pp. 133–153.*

Inhalation of coal, stone, and cement dust produced in guinea-pigs a basophilia of the red cells like that due to lead; the rabbit reacts to these dusts only with an increase in the polychromatic cells. Inhalation of Thomas slag dust causes a pronounced polychromasia in the rabbit. On the basis of the preceding experiments, it is assumed that this dust also would result in a typical basophilia in guinea-pigs. The inhalation of calcium hydroxide produces no noteworthy change in the red blood picture either in the guinea-pig or in the rabbit. No injurious effect on the growth and health of the animals was observed for any of the dusts studied.

Stone dust (clay slate) produced the most stimulating effect on the blood forming organs, obviously because of its high silica content. In the calcium experiments the negative results are due to the greater solubility of calcium hydroxide in the organism. The difference in the blood reaction in the guinea-pig and rabbit experiments on the one hand and in the observations on workers in dusty operations on the other hand is explained by the lesser or greater lability of the hematopoietic system.

The results of the guinea-pig experiments are not applicable to man. On the other hand, the rabbit experiments seem to permit conclusions with regard to man. The presence of basophilic granular erythrocytes in the blood stream remains an important criterion of lead effect.

Inhalation of textile dust causes no basophilia in rabbits and no polychromasia of the red blood cells. No injurious effect in the sense of an anemia can be detected.—*Author's Summary.*

THE BLOOD IN EXPERIMENTAL BENZINE POISONING. *L. B. Brüllowa, A. S. Brussilowskaja, N. W. Lazarew,*

M. P. Lübimowa, and D. I. Stalskaja. Arch. f. Hyg., Sept., 1930, vol. 104, pp. 226–238.

Experiments in which 100 rabbits, seventy guinea-pigs, and thirty white mice were exposed to the fumes of gasoline-benzine lead to the following conclusions:

1. Acute poisoning due to a single exposure to very high concentrations shows a decrease in erythrocytes and lowered hemoglobin. In most cases there is a transient hyperleukocytosis, the so-called toxic "stippling" of the neutrophils, an increased settling velocity of the erythrocytes, and a slight decrease in their resistance to saponin.

2. In cases of acute poisoning due to repeated exposures to high concentrations there is an increase in "polychromasia," and a moderate number of reticulated red blood cells appear. The "toxic" granulation of the white blood cells is more definite.

3. In chronic poisoning there are no further notable changes in the blood.

4. The hemolytic effect of benzine appears only on exposure to considerable concentrations of vapor and gives no explanation of chronic professional gasoline poisoning.

The experimental findings and the blood findings of women workers in rubber plants lead to the conclusion that the blood changes in gasoline poisoning are not at all significant.—L. T. F.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

THE VALUE OF HIGH OXYGEN IN PREVENTING THE PHYSIOLOGICAL EFFECTS OF NOXIOUS CONCENTRATIONS OF CARBON DIOXIDE. *E. W. Brown. U. S. Nav. Med. Bull., July, 1930, vol. 28, pp. 523–553.*

The two objects of the present investigation were to determine the following: (1) the influence of high oxygen on the noxious effects of high carbon dioxide in submarines and (2) the effect of high concentrations of carbon dioxide on physical and mental efficiency. The term high oxygen in these experiments signifies the maintenance of approximately normal oxygen under conditions of rebreathing in a closed space.

The tests were conducted in a lead lined respiration chamber of approximately 654 cubic feet capacity equipped with a cooling system whereby the temperature was controlled within comfort limits. Oxygen and carbon dioxide were supplied to the respiration chamber by means of an arrangement of recording wet meters and flowmeters. The air analyses were determined with the Henderson-Orsat apparatus.

A total of eleven persons served as subjects of the tests, four being ordinarily designated for each experiment. The duration varied from five and one-third to twelve hours, the average approximating eight hours. The subjects were not aware of the air conditions, thus eliminating the psychologic factor in connection with the effect of oxygen.

The following physiologic data were determined at designated intervals: pulse rate, respiration rate, the minute-

expiration volume, the systolic and diastolic blood pressure, the body temperature, and the Schneider index circulatory efficiency. Mental efficiency was tested by standard methods in certain of the experiments. The average temperature and relative humidity of the respiration chamber were recorded hourly.

A group of three tests was carried out in which the final carbon dioxide ranged from 4.7 to 5.2 per cent. and the oxygen from 17.8 to 15.5 per cent. The oxygen was gradually reduced by rebreathing in proportion to the rise of carbon dioxide. No effect on breathing was noted at 2 per cent. carbon dioxide except on exertion. The subjects in general were not definitely conscious of increased respiratory effort at rest until approximately 3.5 per cent. was reached.

At the close of the tests of this group slight depression, headache, chilliness, and fatigue were the chief symptoms. Body temperatures were subnormal. Breathing was labored but there was no feeling of actual dyspnea with carbon dioxide below 5 per cent. On the other hand, with carbon dioxide at 5.2 per cent. and oxygen at 15.8 per cent. some shortness of breath at rest was reported. Labored breathing was more rapidly progressive above 4.5 per cent. of carbon dioxide. The reaction of individuals to the air conditions varied considerably. The symptoms as described represent the majority of the subjects.

A group of four tests was conducted in which the final carbon dioxide varied from 4.3 to 4.7 per cent. and oxygen from 18.2 to 23.4 per cent. Oxygen was supplied and the effects were contrasted with those of the above group in which the oxygen was allowed to diminish. The subjective symptoms of depression, headache, chilly sensations, and fatigue appeared to be somewhat less with the high oxygen group but the differences were not clear cut. The depth and rate of breathing were not influenced.

In another group of three tests, oxygen not being supplied, carbon dioxide reached the higher concentrations of 5.6 to 5.8 per cent., the oxygen varying from 16.1 to 14.2 per cent. It was again observed that the subjects were not conscious of breathing effort at rest until approximately 3.5 per cent. of carbon dioxide was reached. The stage of panting with subjects inactive was not particularly noticeable to observers under 4 per cent. of carbon dioxide. The physiologic effects in this group were so severe that it was not considered advisable to expose the subjects to higher concentrations—certainly not in excess of 6 per cent. of carbon dioxide. One test was discontinued because of the severity of the symptoms and it was necessary to release certain subjects before the completion of other tests.

In addition to the depression, dyspnea and severe panting, and headache, certain subjects developed dizziness and nausea. Headache persisted for one to three hours following the tests. There was a wide individual variation in the type and severity of symptoms. Chilly sensations were general with a final body temperature of 1° to 3°F. subnormal. Persistent fatigue subsequent to the tests was an outstanding symptom.

Still another group of five tests was

conducted for comparison with the series just considered, oxygen being supplied. Final carbon dioxide ranged from 5.5 to 5.8 per cent. and oxygen from 18.5 to 21.9 per cent.

It was the general impression of observer and subjects that such subjective effects as panting, dyspnea, headache, nausea, and chilliness and fatigue were somewhat less in the high oxygen group. The differences, however, were not striking, the more decided being reduction of dyspnea and less fatigue during and after the tests.

The objective data showed slight differences, except for the minute-expiration volume. The final pulse rate exhibited a tendency to fall in both high and low oxygen groups, but was more marked in the former. The rise in the respiratory rate showed a similar trend in both. The total increase in the minute-expiration volume in the low group for the three tests was 235, 294, and 356 per cent., respectively; for four tests of the high group, 106, 106, 330, and 121 per cent. This is evidence that with high oxygen the excitability of the respiratory center to carbon dioxide was materially reduced, but additional tests would be required in order definitely to settle the question.

The final body temperatures were 1° to 3°F. subnormal in both the high and the low oxygen groups. In soda-lime absorption tests with essentially similar air conditions prevailing, except that carbon dioxide was low, subnormal body temperatures and sensations of chilliness were absent; this also being observed in control tests when ordinary air was supplied.

An air combination of low oxygen and low carbon dioxide was set up by utilizing soda lime. Initial symptoms of oxygen depletion were noted between 13 and 14 per cent. of oxygen. No signs of oxygen deficiency or other reactions were manifest between 14 and 15 per cent. of oxygen with low carbon dioxide. The train of symptoms associated with 5.8 per cent. of carbon dioxide and 14 to 15 per cent. of oxygen were severe and were lessened to a considerable extent when oxygen was kept at the normal level. It is concluded that this result was due to the prevention of the effects of oxygen shortage being added to those of excess of carbon dioxide, and not to any antidotal influence on the action of carbon dioxide as such.

The Schneider index was of value in these tests only as indicating the stimulating effect of carbon dioxide on the cardiovascular system. With a single exception all subjects showed a rise in the final score at the high percentages of carbon dioxide, the average increase being 4.3. Under conditions of fatigue in ordinary air a decrease would have been looked for. The rise reflects the immense strain to which the heart and blood vessels were subjected.

Mental efficiency was tested under conditions of high carbon dioxide and low oxygen, and high carbon dioxide and high oxygen. In one test the carbon dioxide reached 5.8 per cent. and the oxygen was reduced to 14.2 per cent.; in another the corresponding data were 5.3 and 20.5 per cent., respectively.

Army Alpha cancelation and addition tests were carried out at successive intervals. The functions of attention, memory, association, and deduc-

tion were involved. Attention and motor co-ordination were also tested with a special type of apparatus described in the report. The results were striking in that the psychologic effects were slight. While there was some falling off at 5.8 per cent. carbon dioxide, still the scores were not materially lowered for any of the types of measurement employed. The conclusion is drawn that an excellent psychologic reserve was maintained even though the subjects were working under conditions of toxic percentages of carbon dioxide.

It is felt that the personnel could carry on their usual submarine duties for a protracted period, if carbon dioxide did not exceed 5 per cent. Even at approximately 6 per cent. of carbon dioxide the men could probably still carry on for a short time, the efficiency curve falling rather rapidly between 5.5 and 6 per cent. It is believed that the majority would be completely incapacitated above 6 per cent. of carbon dioxide, which is regarded as the critical point. The supply of oxygen would improve physical and mental efficiency between 5 and 6 per cent. of carbon dioxide but would not prolong it beyond the latter figure.—*Author's Summary.*

THE PHYSIOLOGICAL EFFECTS OF HIGH CONCENTRATIONS OF CARBON DIOXIDE. *E. W. Brown. U. S. Nav. Med. Bull., Oct., 1930, vol. 28, pp. 721–734.*

1. The subjective and objective effects of toxic concentrations of carbon dioxide on men were studied; the percentages varying from 5.5 to 12.4 per cent. with oxygen ranging from 14.4 to 39.7 per cent.

2. The concentrations of carbon dioxide were so excessive as to be tolerated for only a comparatively short time. The periods of exposure did not represent the extreme limit of endurance but a stage was reached beyond which serious symptoms were impending. The maximum period of exposure was twenty-two minutes at 6 per cent. and the minimum one-half minute at 10.4 per cent. carbon dioxide.

3. The respiratory rate per minute showed a tendency to a slight increase above normal, the average rise being only 8 at 10.4 per cent. carbon dioxide. The average increase at 12.4 per cent. carbon dioxide was negligible, reaching only 4.

4. The pulse rate per minute was accelerated in moderate degree, the average rise varying from 7 at 6 per cent. carbon dioxide to 19 at 10.4 per cent. It was 13 at 12.4 per cent.

5. The systolic blood pressure always increased and rose with ascending carbon dioxide concentration. The maximum increase at 6 per cent. carbon dioxide was 18 mm., the minimum 4 mm.; the corresponding data at 10.4 per cent. were 52 and 30 mm.; at 12.4 per cent., 97 and 24 mm. The average percentage rise was 55 per cent. at 12.4 per cent. carbon dioxide, 33 per cent. at 10.4 per cent., and 24 per cent. at 7.5 per cent. carbon dioxide.

6. The diastolic blood pressure showed in general a trend similar to that of the systolic pressure. The maximum increase at 6 per cent. carbon dioxide was 10 mm., the minimum 0 per cent.; the corresponding data at 10.4 per cent. were 34 and 20 mm.; at 12.4 per cent., 29 and 8 mm.,

being less than at 10.4 per cent. The average percentage rise was 27 at 12.4 per cent. carbon dioxide, 38 at 10.4 per cent., and 20 at 7.5 per cent.

7. The average minute-expiration volume per minute increased as follows: 203 per cent. at 6 per cent. carbon dioxide, 225 per cent. at 7.5 per cent., 228 per cent. at 8.8 per cent., 279 per cent. at 10.4 per cent., and only 153 per cent. at 12.4 per cent. carbon dioxide. The last-named result is of particular interest as it indicates a fall in the lung ventilation at this concentration of carbon dioxide, whereas there was rising increase up to and including 10.4 per cent. carbon dioxide. There were wide individual differences between subjects as was observed in the other physiologic responses.

8. The subjective symptoms were as follows: Marked dyspnea resembling the effect of extreme physical exertion; dizziness; flushing and sweating of the face; feeling of stupefaction and an apprehension of impending collapse. The after effects were practically limited to moderately severe headache but not persisting beyond thirty minutes. There was marked individual variation in the severity of the symptoms, certain subjects showing much less intolerance to high concentrations of carbon dioxide than others. It is not believed that any of the subjects could have withstood 10 per cent. carbon dioxide for longer than ten minutes without losing consciousness.

9. There was no evidence that high oxygen alleviated the toxic effects of the excessively high concentrations of carbon dioxide employed in these experiments.—*Author's Summary.*

Outbursts of Carbon Dioxide in Mines. *Foreign Letter (London), Jour. Am. Med. Assn., Aug. 23, 1930, vol. 95, p. 605.*

The disaster in which 150 men were suffocated in a Silesian mine has just been reported. It appears that the accident was due to an electrically driven pick or blasting shot penetrating into a mass of disintegrated coal charged with carbon dioxide, which then filled all the workings. Professor J. S. Haldane, F.R.S., our leading authority on such mining dangers, points out in a letter to the *Times* that while such outbursts of carbon dioxide are unknown in Great Britain, they were described more than thirty years ago in the coal mines in the Gard district of France and have since occurred in Silesian and other coal fields. In one outburst in the Gard district the gas was liberated by the firing of a shot in sinking a shaft into a new seam. The precaution was taken of firing the shot from the surface when the mine was clear of men. The shot firer heard a rumbling sound and noticed that the air was blowing up the shaft instead of down. Realizing what had happened, he told the men who were near to run for their lives. All escaped except an engineman, who did not hear and was suffocated. The gas and coal dust shot high into the air and for a time discharged like a volcano. Being heavier than air it came back, spread along the ground like water, and reached a village a kilometer away, where it suffocated fowls and dogs, but the level at this distance was too low to kill human beings. The condition giving rise to these outbursts was revealed in 1917 by Mr. J. I. Graham,

J. I. H.
April, 1931

deputy director of the Mining Research Laboratory, University of Birmingham. He showed that coal in the presence of even a moderate pressure of gas will absorb a large volume of it. On reduction of the pressure the gas is given off again. If the coal is disintegrated, as is apt to happen in the neighborhood of a fault, the gas comes off rapidly and is blown out violently with the disintegrated coal when the confining support is removed. Enormous outbursts of gas may thus occur from a comparatively small volume of coal, particularly if the adsorbed gas is carbon dioxide, since with a given pressure far more of this gas is adsorbed than, for instance, is methane. The outbursts are also more dangerous, since a much lower percentage of carbon dioxide asphyxiates. In this country several lives have been lost through sudden outbursts of methane from disintegrated coal, but these are not so dangerous as outbursts of carbon dioxide.—C. K. D.

OBSERVATIONS ON CARBON DIOXIDE POISONING IN MINE DISASTER AT NEURODE. *G. W. Parade. Deutsch. med. Wchnschr., Aug. 15, 1930, vol. 56, p. 1385.*

FATAL CARBON MONOXIDE POISONING FROM THE GAS HEATING OF A CLOTHES BOILER. *F. Naville and C. Soutter. Abstr. from Rev. méd. de la Suisse Rom., May 25, 1930, vol. 50, pp. 336–341, in Clin. Jour., Dec. 3, 1930, pp. 585–586.*

The authors report from the Medico-legal Institute of Geneva four deaths from carbon monoxide poisoning which occurred under unusual circumstances. A man, on returning home, found his wife and 3-year old child inanimate on the kitchen floor. The child was dead, but after long efforts the mother was resuscitated. A cat was also lying dead. The necropsy showed that the death of the child was due to carbon monoxide poisoning. Its blood contained 16.5 per cent. of carbon monoxide. The husband did not notice any odor of gas, but the kitchen was full of steam, which came from a vessel in which clothes were boiling over gas. In another case a nurse, aged 44, who lived alone was found dead in an armchair in her kitchen. On the gas cooking stove was a large boiler containing clothes and water. The person who found her turned off the gas without seeing whether it was alight. There was no odor of gas. The body showed the color of carbon monoxide poisoning and the blood contained 16 per cent. In the last case, a woman of 27 was found dead on her bed, while near the closed window lay the body of a man. In a recess outside the room was a boiler on a gas stove, which was alight. The boiler contained only clothes, which were mostly carbonized and gave an acrid odor, but there was no smell of gas. The woman's blood contained 18 per cent. of carbon monoxide, and the man's 20 per cent.

An experiment was performed by filling a boiler three parts with water and heating it on the stove. The air in the locality was found to contain 0.4 per cent. of carbon monoxide. When a gas stove burns normally, no carbon monoxide is given off, but when a flame licks a surface, carbon monoxide is produced, and the quantity is greater the bigger the surface

and the lower its temperature. The quantity of carbon monoxide formed may be sufficient to be fatal. Illuminating gas is a mixture of hydrogen, hydrocarbons, and carbon monoxide. The former two are the more combustible, *i.e.*, they burn at a lower temperature than the latter. With such a large vessel as a boiler filled with water the flame is spread over a cold surface and cooled. The hydrogen and hydrocarbons are burned, while the carbon monoxide is burned not at all or incompletely.

A clothes boiler is the largest domestic vessel used for boiling and gives the most favorable conditions for production of carbon monoxide. Moreover, there is only a small space between the burner and the bottom of the vessel. Finally, the large quantity of liquid to be heated prolongs the period of dangerous combustion. The danger is increased by the fact that there is no smell of gas. These accidents usually occur in a confined atmosphere, in a room with the windows and door shut. But complete absence of ventilation is not necessary. Indeed in the third accident the recess where the boiling took place had a casement window which did not shut hermetically, and it was in the adjacent room that the victims were asphyxiated.—E. L. C.

GAS POISONING AND BLOOD TRANSFUSION. *A. Sennels. Abstr. as follows from Ugesk. f. Laeger, April 10, 1930, vol. 92, p. 358, in Jour. Am. Med. Assn., July 26, 1930, vol. 95, p. 312.*

In Sennels' case of accidental gas poisoning with grave symptoms following temporary improvement after administration of oxygen and stimulants, recovery is believed to have been due to blood transfusion, preceded by venesection.

SKIN CHANGES AND NERVOUS DISTURBANCES DUE TO ACUTE POISONING FROM ILLUMINATING GAS. *A. Biancalani. Abstr. as follows from Gior. di clin. med., Aug. 10, 1930, vol. 11, p. 765, in Jour. Am. Med. Assn., Nov. 1, 1930, vol. 95, p. 1383.*

Biancalani reports that in the case studied by him the palpebral ptosis, whether it is brought into relation with central hemorrhages or with peripheral changes, disappeared in a few days. The partial paralysis, however, in the field of the median and the radial nerves, persisted five months after the poisoning and was showing a slight improvement as the result of suitable electrotherapeutic applications.—C. K. D.

CLINICAL AND ROENTGEN OBSERVATIONS ON LUNGS AND HEART FOLLOWING POISONING WITH ILLUMINATING GAS. *M. Israelski and E. Lucas. Abstr. as follows from Klin. Wchnschr., May 24, 1930, vol. 9, p. 978, in Jour. Am. Med. Assn., Aug. 30, 1930, vol. 95, p. 700.*

Two cases of poisoning with illuminating gas are reported by Israelski and Lucas. The authors describe the results of the clinical examination and the roentgenogram. Roentgen examination of the lungs revealed peculiar changes. When the roentgen examination was repeated about two weeks later the changes were no longer visible. The authors think that these temporary changes that appeared in the roentgenogram were caused by multiple hemorrhages from the pul-

monary vessels. In one of the patients there also existed an acute dilatation of the heart, which formerly had been observed by Zondek in persons with gas poisoning.—C. K. D.

CYANIDE POISONING: NEW EFFECTIVE TREATMENT. *M. Schmidt. Abstr. as follows from Ugesk. f. Laeger, June 5, 1930, vol. 92, p. 548, in Jour. Am. Med. Assn., Sept. 13, 1930, vol. 95, p. 832.*

Schmidt feels that his excellent results after an injection of sodium thiosulphate, together with Feyerabend's even better results, indicate this as the only permissible method in cyanide intoxication.—C. K. D.

HYDROGEN SULPHIDE IN INDUSTRY —OCCURRENCE, EFFECTS, AND TREATMENT. *W. P. Yant. Am. Jour. Pub. Health, June, 1930, vol. 20, pp. 598–608.*

1. Hydrogen sulphide occurs more widely, is more toxic, and constitutes a greater industrial health hazard than is generally realized. The principal health hazardous occurrences of the gas are in connection with gypsum mines, sulphur mines, tunnels and caissons in certain localities, sewers and other confined spaces where decomposition of organic matter takes place, blasting of heavy sulphide ores, use of black blasting powder in coal mines, natural gas from certain fields, production and refining of high-sulphur petroleum, its use as a reagent in manufacture of dyes, pigments, and chemicals, and in the rayon industry. The toxicity is comparable to hydrogen cyanide.

2. Two distinct types of poisoning exist—subacute and acute. The former is due to a direct irritating action of the gas on the tissues, producing conjunctivitis and moderate to severe respiratory irritation. Acute poisoning is the result of a toxic action on the nervous system produced by the absorption and presence of hydrogen sulphide in the blood. Unconsciousness and respiratory failure usually occur within a few seconds after exposure and the important reaction is paralysis of respiration followed in five to ten minutes by cardiac failure. There are no warning symptoms and no pain. Death from acute poisoning is due primarily to asphyxia.

3. There is no indication that abnormal combinations with the hemoglobin are formed or that the poisoning is cumulative. Also, there is no indication of a chronic type of poisoning other than would be expected from repeated irritation of the eyes and respiratory passages. The gas is rapidly oxidized in the blood to form nontoxic compounds, ultimately sulphates.

4. Treatment of the subacute type of poisoning is principally symptomatic. With acute poisoning, rescue must be effected and respiration induced at once by artificial means.

5. Although the characteristic odor of hydrogen sulphide can be detected in dilution of one part in ten million parts of air (a concentration far below that causing deleterious effects after prolonged exposure), fatigue of the sense of smell occurs rapidly, thereby excluding the use of the odor intensity as a warning.

6. Hydrogen sulphide in 100 per cent. concentrations has been found to have a surface action on the skin (discoloration, red mottling, and erythema). An exposure of the naked

arm for an hour, however, did not cause symptoms of action on the nervous system. The entire body of persons has been exposed thirty minutes to 2 per cent. hydrogen sulphide in air by volume without noticeable effects of any kind. It is concluded that no serious trouble will be experienced by absorption through the skin when respiratory protective devices are worn.

7. Suitable types of respiratory protective devices in the forms of canister gas masks, hose masks, and self-contained oxygen breathing apparatus are available. Each type of device has its field of use and its limitations.

8. The training of workmen to avoid exposure; the design of equipment to eliminate places of exposure; the use of respiratory protective devices for performing operations in contaminated atmospheres and for emergency work; and the training of workmen in methods of emergency treatment will markedly lessen industrial hazards from hydrogen sulphide.—*Author's Summary.*

NOTES ON HYDROGEN SULFIDE POISONING. *L. B. Allyn. Indust. and Engin. Chem., Feb., 1931, vol. 23, p. 234.*

This is a report of two deaths at Chicopee, Mass., with excerpts from the reports of the coroner and of the medical examiner.—P. D.

LEAD POISONING. *H. Hegna. Abstr. as follows from Norsk. Mag. f. Laegevidensk., June, 1930, vol. 91, p. 673, in Jour. Am. Med. Assn., Sept. 27, 1930, vol. 95, p. 978.*

Hegna presents six cases of lead poisoning due to inhaling and swallowing lead dust. In four cases the intoxication occurred in spite of the use of masks during work. Two of the patients had a transient azotemia without other signs of a simultaneous renal disease.—C. K. D.

REMARKS ON ACUTE LEAD POISONING: ITS PREVENTION, DIAGNOSIS AND TREATMENT. *C. A. Wells. Canadian Med. Assn. Jour., June, 1930, vol. 22, pp. 825–828.*

This paper refers to cases of acute lead poisoning occurring in men engaged in the manufacture of storage batteries. The symptoms and signs of lead poisoning are given and are compared with the symptoms of the commoner abdominal disorders (duodenal ulcer, gallbladder disease, obstruction, appendicitis, intestinal influenza). Treatment by the method of de-leading is described.—L. T. F.

STUDY OF THE COAL-TAR PITCH, WITH SPECIAL REGARD TO ITS EPITHELIOMA-PRODUCING FACTOR. *S. Shibata. Monographiae Actorum Dermatologicorum. A. Series Dermatologica, No. 5, pp. 106. Kyoto, Instit. Dermatosyphil., Universitas Imperialis, 1929.*

Reviewed as follows in Jour. Am. Med. Assn., Aug. 16, 1930, vol. 95, p. 553.

A large number of studies have been made to determine the carcinogenic substance or substances in coal tar. At the present stage of investigaiton it seems probable that no specific substance can be incriminated. In general, the fraction produced by distillation at high temperature has been found more effective than that obtained at lower temperatures. The residual pitch has been found to be carcinogenic both in man and in

animals. This monograph is a study of the carcinogenic properties of the fractions obtained by distillation of pitch, those being selected which are acid, neutral or alkaline. The neutral portion is most active in producing growths in the rabbit, and, of the neutral fractions, those distilling between 200 and 240 degrees at a pressure of 4 mm. were more active than the others, thus confirming in a general way the investigations hitherto made. The text of the monograph is in Japanese, but there is a four-page abstract in English which gives conclusions. It might be mentioned in passing that, in much of the tar work with rabbits, while papillomas are easily produced, the term "carcinoma" has been too frequently applied by incautious investigators to neoplasms which may regress spontaneously, are curable by very small amounts of X-rays, do not metastasize, and are not inoculable, so that they should be considered to be papillomas. The author's photomicrographs show that most of the growths produced were not true carcinomas; but this matter has nothing to do with the main point of his study, which was to determine the effects of different fractions of the pitch in producing growths resembling epitheliomas.

TAR CARCINOMA IN MONKEYS. *C. Bonne, J. Lodder, and G. M. Streef. Abstr. as follows from Nederl. Tijdschr. v. Geneesk., 1930, vol. 74, first half, pp. 1727–1744, in Bull. Hyg., Dec., 1930, vol. 5, pp. 953–954.*

Experiments were carried on with twenty Macacus cynomolgus monkeys at the Pathologic Institute in Batavia. The skin over the abdomen was painted with tar twice weekly. After twenty-five weeks patches of thickened skin could be noticed macroscopically. They later developed into sessile papillomas. The treatment was stopped as soon as the papillomas became ulcerated. After some time the growths showed retrogressive changes and gradually disappeared. In no case were secondary growths seen. The animals showed a slight loss of weight during the treatment.

Histologically the early changes in the skin were identical with those seen in rats and rabbits treated with tar, but later the epithelial elements showed a more marked tendency to infiltration of the deeper tissues than is usually seen in rats. Many cell nests and mitotic figures could be demonstrated. The retrogressive changes occurred mostly through gradual keratinization of cells placed in dense connective tissue. In some cases the epithelial cells were seen lying in young vascular connective tissue infiltrated with round cells, leukocytes, and eosinophils.

In view of the benign character of these tumors, the authors point out that infiltrative growth does not necessarily mean that the tumor is malignant. All new growths show continuous progressive and retrogressive changes and their malignancy depends on the preponderance of active cellular growth over retrogressive changes. The disappearance of tar carcinoma in monkeys is an extreme example of retrogressive changes in new growths. —H. L.

THE DANGERS OF THALLIUM. *L. Teleky. Zentralbl. f. Min., 1929, Abt. A, no. 11, pp. 396–397.*

Thallium preparations are used in medical science and also as medicaments, the dose being 8 mg. of the acetate to a kilogram of body weight. Only children tolerate the remedy; juveniles and adults do not bear it. An explanation lies in changes of the endocrine system which develop with growth of the individual. Industrial exposure to fumes and dust of thallium compounds leads to a condition which shows itself chiefly by a coloration, the hair becoming reddish and then falling out. There are also pains in the limbs, chiefly in the knees and calves, which may be so severe that they compel the patients to draw sick pay for from one to three weeks. Severe symptoms were observed among workers who were employed on this substance for a few months, and in two workers there was a chronic inflammation of the kidneys. Thallium preparations exert a specific dangerous effect on the eyes. Of six persons who were employed on these preparations, one developed atrophy of the optic nerve after four months, and in another optic neuritis developed after three months. Workers with salts of thallium should prevent the escape of vapor or dust, or divert by suitable exhaust arrangements what cannot be prevented and might be inhaled. The material should be handled only when indiarubber gloves are worn. Everyone who has to work with thallium should undergo a medical examination of the eyes every six to eight weeks, to detect any changes of the optic nerve as early as possible.—A. J. C.

Zinc Content of Animal Bodies. *G. Bertrand and Y. Beauzemont. Abstr. as follows from Ann. de l'Inst. Pasteur, Aug., 1930, vol. 45, p. 247, in Jour. Am. Med. Assn., Oct. 25, 1930, vol. 95, p. 1299.*

Bertrand and Beauzemont proved through experiments on seventy-one white rats that the proportion of zinc in the bodies of animals decreases from the time of birth to weaning because of the deficiency of zinc in the milk diet. The zinc content then increases throughout the period of rapid growth and remains constant in adults. In old age it again shows an increase.—C. K. D.

DUST HAZARDS AND THEIR EFFECTS

Concerning the Absorption of Solid Air-Dispersed Material by the Respiratory System. *H. Weber. Arch. f. Hyg., Nov., 1930, vol. 105, pp. 101–123.*

Dr. Weber points out that particle size of inspired dust is of importance in determining the amount retained and consequently the effect on health.

With narcotized dogs as subjects and freshly formed, highly dispersed lead fume as the inspired dust, an average percentage retention of 10.7 over the inspired concentration range of 52 to 173 mg. per cubic meter of lead was found. The fume was generated in an electric arc and its concentration was determined by electric precipitation. The upper limit of particle size of the lead fume was 0.5 micron.

Detailed description of apparatus and procedure is included.—C. E. B.

DUST AND PULMONARY DISEASE. *A. E. Russell. Jour. Am. Med. Assn., Dec. 6, 1930, vol. 95, pp. 1714–1716.*

Morbidity and mortality records indicate that workers exposed to dust have excessive rates of respiratory diseases, inorganic dusts producing more pulmonary disability than organic dusts.

Silica (SiO_2) of the crystalline variety (quartz) is the element in dust that produces greatest pulmonary damage, and it is present in varying extents in most industrial dusts. The disease of silicosis is insidious in its onset and progress, presents but few symptoms or physical signs in its early stages, and is almost invariably complicated by tuberculosis after a number of years of exposure, the time depending on the concentration of the dust and the percentage of free silica which it contains. Latent tuberculosis in persons entering dusty trades is usually activated after exposure to silicious dust, and persons with latent tuberculous lesions, beginning work in the granite industry, develop silicosis more rapidly than workers with no signs of tuberculosis and no history of prolonged exposure to it.

It was an interesting observation in the study of workers in dusty trades that when patients had been exposed long enough to develop silicosis and then changed to non-dusty occupations, they did not thus materially lessen their chances of escaping a final tuberculous complication.

Before a dusty trade can be absolved of its danger or stamped as dangerous, the concentration of dust and its chemical and petrographic analysis must be shown.

Masks frequently give a false sense of protection. Removal of dust at its source is preferable.

There has been a great reduction in the death rate from tuberculosis among the general population during recent years, while among workers in dusty trades there has been a great increase during the same time in the death rate from this cause.—K. R. D.

PNEUMONOKONIOSIS PROBLEM. *R. Menzel. Beitr. z. Klin. d. Tuberk., June 23, 1930, vol. 74, p. 407.*

PNEUMONOKONIOSIS AND TUBERCULOSIS. *W. May. Beitr. z. Klin. d. Tuberk., June 23, 1930, vol. 74, p. 433.*

PULMONARY SIDEROSIS: TWO CASES WITH RETICULO-ENDOTHELIAL SIDEROSIS. *M. G. Bohrod. Abstr. as follows from Arch. Path., Aug., 1930, vol. 10, p. 179, in Jour. Am. Med. Assn., Oct. 18, 1930, vol. 95, p. 1205.*

Two cases of pulmonary siderosis are reported by Bohrod. One, in which the dust was metallic iron, produced the black variety of siderosis and ended in a florid tuberculous bronchopneumonia. One, in which the dust was iron ore, produced the siderosis of the red variety and the concomitant tuberculosis of the fibrotic type and limited to the lymph glands. In both cases there was a continuous attempt at excretion of the iron by macrophages which carried it into the alveoli and thence into the sputum, by excretion through the bronchiolar mucosa or by transference to the lymph nodes. In the last event, the pigment was either deposited in the gland or was carried through the gland and reached the blood stream probably by way of the thoracic duct.

Having reached the blood stream, the iron was deposited in the cells of the reticulo-endothelial system. In addition to transportation, there was gradual transformation of the iron. Only the soluble iron could be transported and was found intracellularly. In the black variety, in which more silicon than iron was present in the lung, only the more soluble iron found its way into the blood stream. Insoluble iron was found extracellularly in dense fibrous tissue. Where the accumulations of iron were greatest, the amounts present were 8.9 and 7.9 per cent. of the moist weight of the lungs.—C. K. D.

REPORT ON THE OCCURRENCE OF SILICOSIS AMONGST GRANITE WORKERS. *C. L. Sutherland, S. Bryson, and N. Keating. H. M. Stationery Office, 1930.*

This short document is in great contrast to the recent exhaustive American inquiry into the granite industry. The investigators barely record the data collected, and leave to Dr. E. L. Middleton to explain their bearing in an introduction.

Signs of pulmonary fibrosis were found about as prevalent as among sandstone masons; but radiography indicated that silicosis was much less prevalent. Dressing and carving granite creates much dust through the use of pneumatic tools, but, since granites contain only up to one-third quartz, the proportion of silica in the dust is less than when sandstones are worked. The X-ray shadows differ in type in the two industries, varying with the proportion of free silica in the dust. After examining clinically 494 men, and radiographically 211, a close relation was found between signs of pulmonary impairment and the occupational exposure to dust; the more dusty the process, the more definite the impairment. Nevertheless, silicosis was on the average less advanced than as found among sandstone masons. No dust determinations at the different processes are recorded, and no analyses are given of the granites in the five separate districts visited. An allusion is made to a new type of dust trap for use with pneumatic tools which by catching the dust at the point of origin may serve to minimize the hazard.—E. L. C.

SILICOSIS AND TUBERCULOSIS. *V. Reichmann. Beitr. z. Klin. d. Tuberk., June 23, 1930, vol. 74, p. 452.*

PROTECTION OF THE WORKMEN AND OF THE NEIGHBORHOOD IN THE FIRING OF PULVERIZED COAL. *W. Wietfeldt. Abstr. as follows from Zentralbl. f. Gewerbehyg., May, 1930, N. S. vol. 7, pp. 142–147, in Bull. Hyg., Jan., 1931, vol. 6, p. 20.*

The two dangers to which the workmen are exposed in the consumption of pulverized coal are due: (1) to dust and poisonous gases; and (2) to explosion and fire of the pulverized coal. Inhalation of dust is less dangerous than that of carbon monoxide, etc., which is liable to occur from excessive pressure produced by blockage and consequent discharge from the furnace front and flues. The most dangerous kind of coal from the point of view of explosion is fat coal, *i.e.*, coal with a high gas content, and brown coal. Coal with a 50 per cent. ash content or less is practically free from risk.

The various conditions under which

fires and explosions may take place and the most approved methods for their prevention are described. A section is given to various fire extinguishers and to the causes of fires—often spontaneous—in bunkers. The author deprecates stressing the risks as too serious. For dealing with the escaping ash and grit a brief description is given of: (1) dry; (2) wet; and (3) electrical deposition and separation.—T. M. L.

THE INFLAMMATION OF COAL DUSTS: THE EFFECT OF THE PRESENCE OF FIREDAMP. *T. N. Mason and R. V. Wheeler. Safety in Mines Res. Board, Paper No. 64. H. M. Stationery Office, 1931.*

It sometimes happens that in parts of the roads in a mine—in a return airway for example—the air becomes charged with a small proportion of fire damp, say 1 per cent. This percentage is far below the percentage of fire damp which is explosive and in itself is quite harmless, but it is necessary to consider whether in the unhappy event of a coal dust explosion, this small additional amount of inflammable material would make it more difficult to extinguish the coal dust explosion. In other words, would such conditions require that a higher percentage of stone dust be mixed with the coal dust on the roads in order to neutralize the impetus given to the explosion by the inflammable gas?

A series of tests to provide the answer to this question have been carried out by the Safety in Mines Research Board in the Buxton 4-foot gallery and the answer that they give to the question is "Yes." They answer also the further question "What percentage of stone dust is required to neutralize the effect of a given percentage of fire damp in the air?" This additional percentage of stone dust is found to be different for different kinds of coal, and it is higher for coals of low volatile content than for coals of high volatile content. A coal dust, the danger of which is neutralized by an equal quantity of stone dust when no fire damp is present, would require about 5 per cent. more stone dust for each 1 per cent. of fire damp in the air.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

ANTHRAX AS AN OCCUPATIONAL DISEASE. *H. F. Smyth and V. S. Cheney. Am. Jour. Pub. Health, Feb., 1930, vol. 20, pp. 155–160.*

This report covers returns from thirty-eight states for the period Jan. 1, 1927, to July 1, 1929. There were 162 cases of anthrax, with thirty deaths, as compared with 222 cases and twenty-five deaths for the corresponding $2\frac{1}{2}$-year period in the 1927 report—a decrease in number of cases, but an increase in mortality from 11.27 to 18.5 per cent. There was a decrease in number of cases due to tannery and shaving brush infections, practically no change in incidence from horsehair, and a definite increase from wool handling and contact with livestock. The fatality from

tannery anthrax was comparatively low, as a result of constant watchfulness and prompt, intelligent treatment. In anthrax from animal contact, however, there was an alarmingly high fatality, possibly due to the rapid spread of many actively growing vegetative bacilli introduced into wounds, as against the longer incubation necessary for the development of the comparatively few spores derived from the handling of hides, skins, or hair.

ANTHRAX IN INDUSTRY. *G. W. Schmidt. Abstr. as follows from Schweiz. Ztschr. f. Hyg., 1929, vol. 9, pp. 27–46, in Bull. Hyg., Jan., 1931, vol. 6, p. 60.*

This is a general account of anthrax as an industrial disease with special reference to its occurrence in Switzerland. Between 1901 and 1927, there were fifty-three fatal cases of anthrax—fourteen in farmers, four each in housewives, butchers, and hair workers, and the others in various occupations. The situation in Germany is discussed at length.—T. W. M. C.

ARTHRITIS IN RELATION TO INDUSTRY. *J. E. Bacon. Abstr. as follows from Southwest. Med., 1930, vol. 14, pp. 316–318, in Bull. Hyg., Jan., 1931, vol. 6, p. 20.*

Radiography has revealed changes in bones and joints, especially of the spine, without symptoms. Trauma in industry often is only incidental to such prior-existing disease, but crystallizes it into definite incapacity. Chronic arthritis affecting bone, cartilage, and fascia is widespread, and of varying types. Focal infection, often dental, plays a part in this condition; diet may be at fault with constipation and hypertension. Spinal arthritis is common among adult laborers who are prone to disability from minor injuries. Such men are awkward, prone to accidents, and are industrial hazards. After age 50, 67 per cent. of men and 40 per cent. of women are affected. X-ray examination should be made on engagement and then cases should be drafted to suitable work. Arthritis is the result of all the work a man has done in his life, rather than of any particular occupation. Treatment and prevention lie in elimination of focal infections, dietary changes toward the alkaline type of diet, and avoidance of unusual strain.—E. L. C.

STUDIES OF THE ETIOLOGY OF THE COMMON COLD. *G. S. Shibley, K. C. Mills, and A. R. Dochez. Jour. Am. Med. Assn., Nov. 22, 1930, vol. 95, pp. 1553–1556.*

Experiments reported by Shibley *et al.* lead these observers to conclude that the contagious cold in human beings is caused by an invisible uncultivable, filtrable agent which in all likelihood belongs to the group of so-called submicroscopic viruses. Colds can be transmitted successfully from man to the chimpanzee and from man to man by means of Berkefeld filtrates of nasal washings obtained from individuals suffering from spontaneous colds more especially during the period of rising incidence of infection in the community. These experimental colds resemble in all respects colds spontaneously contracted in the natural environment. In apes, one of the significant effects

of infection with the filtrable agent is the stimulation into greatly increased activity of any potential pathogen that may happen to be present in the upper respiratory flora. This the authors regard as of great importance since it seems to explain the marked secondary activity in the respiratory tract of such organisms as pneumococci, Streptococcus hemolyticus, and Pfeiffer's bacillus, which lead to the severe sequelae which sometimes follow the common cold and influenza. In fact, the most important significance of viruses of this type seems to lie in their capacity to incite activity on the part of the more dangerous pathogenic organisms that infest the upper respiratory tract.—K. R. D.

TRAUMA AND PULMONARY TUBERCULOSIS. *N. Gegetchkori and I. Gigineischwili. Abstr. as follows from Ztschr. f. Tuberk., 1929, vol. 54, p. 45, in Am. Rev. Tuberc., Feb., 1931, vol. 23, p. 29.*

The authors report five cases in which a pulmonary process developed shortly after trauma. It is concluded that chest injuries, without breaking of the skin or rib fractures, can activate latent foci, and that the disease process in the majority of cases develops upon the traumatized side.

MILIARY LUNG DISEASE DUE TO UNKNOWN CAUSE. *R. R. Sayers and F. V. Meriwether. Abstr. as follows from U. S. Pub. Health Rep., Dec. 5, 1930, vol. 45, p. 2994, in Jour. Am. Med. Assn., Feb. 14, 1931, vol. 96, p. 561.*

Sayers and Meriwether report the work done in a clinic established at Picher, Okla., for the study and control of silicosis and tuberculosis among the miners. Physical examination, including roentgen examination of the chest, is made of the men prior to employment and at least once yearly thereafter. A total of 18,285 individuals had been examined up to and including December, 1929. About 125 cases of typical miliary lung disease were found by roentgen examination among these 18,285 individuals during routine physical examination. A majority of the affected persons did not have sufficient symptoms to cause them to stop work or to seek medical aid. The most characteristic finding was a large number of discrete, dense, shot-like spots scattered over the lung areas. Tubercle bacilli were present in only two of the eighty-eight cases in which an examination was made of the sputum. Unstained smears of thirty-one cases (all those examined) were positive for fungi. Two types of fungi were identified—Aspergillus fumigatus-fisheri and Aspergillus niger. Ten cases tested with antigen of Aspergillus fumigatus-fisheri gave negative reactions; six cases tested with Aspergillus niger all gave positive reactions. The authors are of the opinion that thirty-eight cases reported by Sutherland as presenting "miliary calcification of the lungs" are probably instances of the same condition that was found at Picher. In addition, they suggest that these miliary calcifications may be due primarily to fungous infection.—K. R. D.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

VITILIGO WITH LICHENOID BORDER IN CHROMIC ACID DERMATITIS. *Werther. Abstr. as follows from Dermat. Wchnschr., 1930, vol. 90, pp. 766–768, in Bull. Hyg., Dec., 1930, vol. 5, pp. 927–928.*

A kind of vitiligo is described developing symmetrically on both forearms six months after the occurrence of severe chrome eczema in a lithographer. Along the line of the ulna it took the form of a large white area with sharply defined hyperpigmented edges. The area was quite smooth and devoid of follicles and hairs.

Werther proceeds to discuss the conditions associated with vitiligo such as infections, psychical disturbances, and the like, as possibly having given origin to his case. He looks upon this as a rare instance of an industrial toxic reaction from the small particles of chrome absorbed through the skin leading to a disturbed innervation. A further peculiarity in his case was that the white area was surrounded by small, red, hard itching papules. He regards this as evidence of a hypersensibility at the point of attack—not a hypersensibility in the usual accepted sense, but depending on an altered innervation. He cites, as the only industrial vitiligo similar to his of which he has cognizance, that of one following a mercurial dermatitis described by Jordan of Moscow.

Various theories such as metameral extension along the nerve from a segment of the spinal cord are broached.—T. M. L.

ON INDUSTRIAL INJURY FROM CHROMIC ACID. *Werther. Abstr. as follows from Deutsch. med. Wchnschr., 1930, vol. 56, pp. 1098–1099, in Bull. Hyg., Dec., 1930, vol. 5, p. 927.*

A case is described in a worker engaged in lithographing, where protection of the hands by application of grease or the wearing of gloves is impracticable. As in so many instances, one attack followed another on resumption of work.

The author acted in his capacity as assessor under the Workmen's Compensation Law of 1929, and had to arrive at the unsatisfactory opinion (from the workers' point of view) that undoubtedly the case was one of chrome ulceration, but seeing that chromic acid was not specifically mentioned in the law, compensation was not obtainable.—T. M. L.

A CASE OF TEAKWOOD DERMATITIS. *E. Hunt. Lancet, Jan. 10, 1931, vol. 1, pp. 75–76.*

A case is reported of irritating dermatitis in a shipwright, resulting twice from handling teak. The eruption started on the hands and forearms, but spread to the face and neck, and on the first occasion was succeeded by a number of boils. Under observation in a hospital, a third attack was induced by the patient's holding a piece of freshly sawn teak in his hand for an hour. The next day an eruption appeared on the backs of the hands and on the face, while the eyes became edematous. Interest attaches to the susceptibility, short period of contact, and spread of the condition to distant parts.—E. L. C.

EFFECT OF NOISE ON HEARING OF INDUSTRIAL WORKERS. A STUDY OF A GROUP OF WORKERS IN NOISY INDUSTRIES. *N. Y. State Dept. Labor, Special Bull. No. 166, Sept., 1930, pp. 42.*

This study includes a group of 1,040 workers, 630 women and 410 men, comprising employees of seven factories making biscuits, tin cans, razor blades, books, shoes, silk hosiery, carpets and rugs, and two groups of clerical workers, one in the New York State Department of Labor and the other in the State Insurance Fund, who have been in clerical work all their working years. The noise to which the factory workers were subjected varied not only in the different factories but in various departments of the same factory.

There were in all 246 cases of deafness, only 155 of which had no history of ear conditions which might have influenced hearing, and which therefore may have some industrial significance. The greatest incidence of deafening was found in the group subjected to the greatest amount of noise—*i.e.*, between 60 and 80 units. In this group of 367 workers, ninety-six, or 26.1 per cent., showed deafening with no apparent reason to account for it. Sixty-six of the ninety-six were from the tin can factory in which the work was done in a large room dominated by the noise of the stamping machine that affected all present whether or not they worked on it. The noise was rather irregularly intermittent in character. The group of 150 subjected to noise of an intensity between 20 and 40 units showed twenty-three, or 15.3 per cent., deafened workers without previous histories; the group of 489 subjected to between 40 and 60 units had only thirty-four, or 6.9 per cent.

There does not seem to be any correlation between the age of workers, the noise to which they are subjected, and the amount of deafening. The greatest number of cases of deafening falls in the group between the ages of 21 and 30 years, comprising sixty-nine of the 155 cases without any history which might otherwise account for their deafening. The amount of noise appears to have been the determining factor since in every age group the largest number of cases fell in the group working under the noisiest conditions, twenty-one out of twenty-four cases in the group under 21 years of age, thirty-eight out of sixty-nine in the group between 21 and 29, twenty-three out of thirty-seven in the group between 30 and 45, and fourteen out of twenty-five in the group over 45 years of age.

The percentage of deafening among workers exposed for only a short time was small, 6 per cent., while there was a steady increase in the percentage with the length of exposure except in the case of those exposed for from five to ten years. Here the fact must be taken into consideration that the groups exposed to industrial noise the longest were also older and advancing age might be a contributing factor. There is a marked difference in the percentage of deafening without history among those exposed for less than a year, 6 per cent., and among those exposed for twenty-five years and over, 26.9 per cent.

Since one factory where there was a constant film of oil vapor in the atmosphere had a larger percentage of

workers with cerumen than any other group studied, it is quite possible that this condition is contributory to the hardening of the wax.

On the basis of the findings in this study, the following recommendations are made:

1. Wherever possible, tests of hearing should be made on all employees at the beginning of employment.

2. Periodic reexaminations should be made where the workers are subjected to more than a moderate amount of noise.

3. Certain types of machines should be isolated.

4. Sufficient ventilation should be provided to remove all vapors.

EFFECT OF GAS EXPLOSIONS ON HEARING. *W. T. Salmon. Oklahoma State Med. Assn. Jour., Sept., 1930, vol. 23, p. 306.*

OCCURRENCE AND PREVENTION OF INDUSTRIAL ACCIDENTS

THE ACCIDENT CLINIC: HOW IT FUNCTIONS AND WHAT IT ACCOMPLISHES. *S. M. Shellow. Personnel Jour., Oct., 1930, vol. 9, pp. 207–215.*

"The Accident Clinic of the Milwaukee Electric Railway and Light Company aims to view the accident record of each high accident man from as many angles as possible. Its personnel includes representatives of the various departments concerned—the Claim, Medical, Welfare, Transportation, Safety, and Educational Departments. A thorough-going study is made of each operator who comes to the attention of the Clinic and a careful follow up is kept after the Clinic contact has been made. The results secured in a year's time with a group of the highest accident men from the various stations of the system are reported. A group of 33 high accident operators had, during an observational period of six months following the clinical examination, 81.5 per cent. fewer accidents than during the six months prior to the examination. Lack of ability was judged to be the most frequent cause of accidents, while faulty attitude was next."

PSYCHOLOGICAL STUDY OF ACCIDENT PRONENESS. *E. Farmer. Personnel Jour., Aug., 1930, vol. 9, pp. 115–120.*

Farmer summarizes the results of the investigations of accident causation which have been carried out by the Industrial Health Research Board during a period of ten years.

INDUSTRIAL SURGERY

SURGICAL WOUNDS IN HUMAN BEINGS. *S. W. Hartwell. Abstr. as follows from Arch. Surg., July, 1930, vol. 21, p. 76, in Jour. Am. Med. Assn., Aug. 23, 1930, vol. 95, p. 623.*

Hartwell made a histologic study of complete, transverse sections of surgical wounds in human beings, both clean and infected, in all stages of healing. Eighty-nine wounds, from one day to nine years old, were studied. He concludes that: Fascia

and dermis do not take any active part in the healing of surgical wounds in human beings. Fat is the site and the basis of the production of new fibrous material in wounds of human beings. Macrophages are the true fibroblasts of wounds in human beings. New fibrous scar tissue is formed at the expense of the cells which produce it. Given the proper chemical material in the healing zone, the physical forces in that zone determine the rate of deposit of fibrous material and the organization of the fibers into a functioning tissue. Macrophages are derived from lymphocytes of the blood which develop rapidly by the ingestion of fat. The fundamental healing process is the same in both clean and infected wounds. The histologic picture of fibrous healing in human beings is different from that in animals. The mechanics of closure of wounds determine the appearance of the scar on the surface and the occurrence of postoperative hernia.—C. K. D.

SURGICAL DIATHERMY IN TREATMENT OF WOUNDS. *W. Spitzmüller. Abstr. as follows from Wien. klin. Wchnschr., July 31, 1930, vol. 43, p. 981, in Jour. Am. Med. Assn., Oct. 25, 1930, vol. 95, p. 1305.*

Spitzmüller describes a method for the treatment of primary accidental wounds. It is a disinfection by means of surgical diathermy. The author reports his observations in 100 cases. He asserts that infection was prevented in all instances. He therefore recommends that disinfection by means of surgical diathermy be tried in other cases, and he thinks that it will prove to be superior to disinfection by excision with the surgical knife.—C. K. D.

BURNS: TYPES, PATHOLOGY AND MANAGEMENT. *G. T. Pack and A. H. Davis. Philadelphia, J. B. Lippincott Co., 1930, pp. 364.*

Reviewed in Jour. Am. Med. Assn., Oct. 25, 1930, vol. 95, pp. 1286–1287.

The authors of this volume are to be congratulated on the masterly manner in which the subject of burns is presented. This excellent treatise is not a mere compilation of data but an amalgamation of a critical selection of the best in the literature with the results of a wide clinical experience. The preface states: "In the preparation of this manuscript, we have included not only our personal experiences, but also a free analysis of the contributions and opinions of other clinicians and investigators." The senior author was initiated into the management of burns by the incidence of a theater fire in New Haven in 1921, and since then has been associated with a second similar disaster and with the study of many individual cases. This experience has given to him an authority seldom encountered. The book is divided into three parts. Part one contains fundamental facts concerning burns and scalds. The historical aspects of the subject are presented together with a discussion of the etiology, incidence, classification, pathology, and cause of death. In part two, consideration is given to the management of thermal burns. Particularly important is the chapter on the character of the immediate treatment of the burned patient and the emphasis laid on the necessity of systemic treatment. "It is the physician's duty to treat the patient as well as the burn and by supportive systemic therapy obviate any visceral mischief and malnourishment." Local

treatment of the injury is given a duly prominent position and is discussed from many points of view. The relative merits of various procedures, such as wet dressings, water bath treatment, sunlight therapy, and occlusive dressings (paraffin, oils, ointments, and powders) are indicated. The technic of skin grafting, the diseases of cicatrices following burns, and the prevention and correction of subsequent deformities are critically reviewed and preferred methods selected. In part three, regional burns by specific agents are discussed. This includes burns by such agents as electricity, lightning, roentgen rays, radium, the sun, caustic chemicals, and the war gases. The final chapter presents the medicolegal aspects of burns and scalds. There are adequate references to the literature at the end of each chapter, and both subject and author indexes are given. The text is brief, clear cut, and decisive. A perusal of this volume gives the feeling that in the present stage of knowledge little can be added to this presentation of burns and nothing can be deleted.

Silver Foil in the Treatment of Burns. *B. Pfab. Abstr. as follows from München. med. Wchnschr., May 16, 1930, vol. 77, pp. 857–858, in Jour. Am. Med. Assn., Aug. 9, 1930, vol. 95, p. 459.*

Pfab saw good results from the application of silver foil in the treatment of various kinds of wounds. He asserts that the application of silver foil is particularly advantageous in the treatment of burns. First, all vesicles are removed and then the silver foil is applied directly to the wound. This method of treatment hastens the casting off of the necrotic parts, the silver stimulates the granulation, the bacterial action prevents infection, the pain is relieved almost instantly, and the frequent change of dressings is done away with. The resulting scars are smooth, and cicatricial keloid formation is almost entirely absent. Disadvantages were not noted. The method was employed in 220 cases of burns; 148 of the patients received ambulatory treatment and 72 hospital treatment. The majority of patients recovered within the first three weeks. A few cases required from four to sixteen weeks for recovery, and in one patient with an electrical burn the treatment required twenty-four weeks. Three patients died. In cases in which the silver foil treatment was instituted immediately, complications did not develop. Paronychias and inflammation of the lymphatic vessels developed only in patients who in the beginning had not been treated with silver foil.—C. K. D.

Paraffin-Wax Treatment of Burns. *C. K. Cook. Wisconsin Med. Jour., Nov., 1930, vol. 29, p. 609.*

Tannic Acid in Treatment of Burns. *W. H. Prioleau. So. Carolina Med. Assn., July, 1930, vol. 26, p. 178.*

Fractures from Standpoint of Industrial Physicians. *C. D. Selby. Michigan State Med. Soc. Jour., Sept., 1930, vol. 29, p. 641.*

J. I. H.
April, 1931

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

THE ENERGY EXPENDITURE IN INDUSTRIAL WORK. *G. Farkas and J. Geldrich. Arch. f. Hyg., July, 1930, vol. 104, pp. 1–23.*

Measurements of respiratory exchange by the Douglas-Haldane method confirm, in a general way, the old findings of Becker and Hämäleinen (1914) in that the increase in metabolism due to work is proportional to the effort involved in performing a given task. The increase is lowest for tailors and highest for blacksmiths.—L. C. B.

BEHAVIOR OF DIASTOLIC BLOOD PRESSURE FOLLOWING BODILY EXERTION: ITS CLINICAL SIGNIFICANCE. *F. Schellong. Abstr. as follows from Klin. Wchnschr., July 19, 1930, vol. 9, p. 1340, in Jour. Am. Med. Assn., Oct. 18, 1930, vol. 95, p. 1217.*

In functional tests of the circulation after bodily exertion, Schellong observed that in some persons the diastolic blood pressure showed a marked decrease. He made tests on healthy persons and on persons with vasoneurosis and hypertension. The bodily exertion to which the persons were subjected was the climbing of stairs (fifty steps). Immediately after the exertion the systolic and the diastolic blood pressure was determined by auscultation, and the heart frequency was registered with the electrocardiograph. Diagrams show the results of the tests. The author comes to the conclusion that the determination of the diastolic blood pressure after bodily exertion reveals certain conditions that cannot be detected when only the systolic pressure and the pulse frequency are measured. In the majority of young patients (aged between 15 and 30 years) with vasoneurosis either with or without hypertension, the diastolic pressure shows an abnormally strong decrease. This may be explained by an abnormal dilatation of the peripheral vessels resulting from the bodily exertion and producing in the patient a sensation of palpitation of the heart. The decrease in the diastolic pressure is not dependent on the heart frequency. In other young persons with vasoneurosis there is normal behavior of the diastolic pressure, but a prolonged tachycardia; in only a few of the patients is the reaction after bodily exertion like that in normal persons.—C. K. D.

DAILY AND MONTHLY RHYTHM IN BLOOD PRESSURE OF MAN WITH HYPERTENSION. *G. E. Brown. Abstr. as follows from Ann. Int. Med., June, 1930, vol. 3, p. 1177, in Jour. Am. Med. Assn., Aug. 9, 1930, vol. 95, p. 447.*

Determination of the blood pressure three times daily has been carried out by a patient with essential hypertension, over a period of three years. There is greater separation of the curves of morning and evening systolic blood pressures in the summer months. The morning and evening pressures tend to approach each other in the spring and in the autumn. Mean systolic blood pressures for each day of the week, during a period of three years, indicate an increase in the systolic pressure on Sunday evening. It gradually becomes lower during the

week. Potassium thiocyanate, when it is administered over periods of months, has a lowering effect on the mean morning systolic blood pressure and tends to cause the readings of blood pressure to fall within a small range. Brown is of the opinion that this suggests that potassium thiocyanate exerts a sedative or stabilizing effect on the vasomotor mechanism.—C. K. D.

SELLING PROPER NUTRITION TO INDUSTRIAL WORKERS. *L. Comstock. Pub. Health Nurse, Aug., 1930, vol. 22, pp. 406–409.*

Miss Comstock, nutrition adviser to the Medical Department of the Eastman Kodak Company, Rochester, N. Y., describes some of the work which has been carried on with various groups of employees, since July, 1922, for the purpose of correcting nutritional defects. The work started with a group of twenty-four undernourished girls from the main office. They were given milk at 10 A.M. and again at 3 P.M.; weights were taken weekly, individual charts of weight were kept, consultations were held frequently, and a food exhibit was set up to show comparative caloric values of common foods. At the end of six months there were eighty girls in the group; they had gained weight, showed physical improvement, and reported feeling much better. The group as such was discontinued at the end of a year, but since then other office workers, both men and women, have taken milk for varying periods of time—always on the recommendation of the doctor or the nutrition adviser.

As a result of the success of this experiment the work has extended to the manufacturing plants, and groups have been conducted not only to study the effect of milk served at rest periods but also to observe the results with cod liver oil and milk, and with malted milk.

Interest in the work has been increased through the publication of nutrition articles in the Company magazine and through exhibits and posters. Workers have been induced to follow improved diets and as a result there has been a decrease in hours lost from work through illness.—M. C. S.

EFFECTS OF HABITUAL USE OF TARTRATE AND ALUMINUM BAKING POWDERS ON UTILIZATION OF FOOD IN RAT. *R. M. Kraft. Abstr. as follows from Am. Jour. Hyg., July, 1930, vol. 12, p. 283, in Jour. Am. Med. Assn., Sept. 6, 1930, vol. 95, p. 753.*

White rats were fed by Kraft from an early age with and without baking powder residues. At the end of a fifteen months' feeding period the utilization of the diets was measured by the conventional method for determining digestibility coefficients. This long-continued feeding on diets that contained residues from tartrate or from sodium aluminum sulphate-calcium acid phosphate baking powders had no noticeable effect on the digestibility of the food constituents. There was no effect on the weight of air dry feces excreted; hence no cathartic action of the baking powder residues was evident.—C. K. D.

AN ADJUSTABLE STOOL CHAIR. *L. J. Haas. Occup. Therapy, Dec., 1930, vol. 9, pp. 367–373.*

An illustration and working draw-

ings are given of a stool chair which was designed for the use of occupational therapy patients interested in metal work and jewelry. It aids good posture and reduces fatigue to the minimum.

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

ELECTRIC CATARACT WITH CYCLITIS. *V. Cavka. Abstr. as follows from Ztschr. f. Augenh., May, 1930, vol. 71, p. 156, in Am. Jour. Ophth., Oct., 1930, vol. 13, p. 937.*

A 30-year old man was exposed to a 220-volt electric current and rendered unconscious for several minutes. Five months later he was injured in a short circuit when a spark jumped to his body while holding a pole in his hand. Ten days later his vision became cloudy in his left eye. A cataract and cyclitis had developed. After a study of the literature the author assumes that the lens and the ciliary body had each been injured directly by the electricity.

NERVE CELL INJURY IN CASES OF HUMAN ELECTROCUTION. *O. R. Langworthy. Jour. Am. Med. Assn., July 12, 1930, vol. 95, pp. 107–108.*

From a study of two cases of electrocution in man, following contact with electric circuits at high voltages, it is demonstrated that changes occur in a majority of the cells of those medullary centers concerned in respiration.

These pathologic changes appear as dislocations of the cell nuclei and swelling of the nucleoli, with deep staining of nuclear materials and cytoplasmic loss of granules. When nuclear injury is evident, the cells probably no longer have the potentiality of recovery. Cells are abnormal in the nuclei of the medulla controlling respiration. The suggestion may be made that if the injury of these cells is slight, only a temporary respiratory block occurs; if greater, breathing will not be resumed.—*Author's Summary.*

ELECTRICAL INJURIES. *W. L. Finton. Michigan State Med. Soc. Jour., Nov., 1930, vol. 29, p. 775.*

INDUSTRIAL ENVIRONMENTAL CONDITIONS

PSYCHROMETRIC TABLES WITH SPECIAL REFERENCE TO DEEP MINING VENTILATION. *C. W. B. Jeppe. Jour. Chem., Metall. and Min. Soc. So. Africa, Oct., 1930, vol. 31, pp. 87–118; Nov., 1930, pp. 158–159.*

This is an excellent review of the physics of mine air. Sections I and II deal largely with the laws of gases and other psychrometric formulas which govern the relationship between barometric pressure, temperature, vapor pressure, moisture content, evaporation, cooling power, etc. In Section III the author makes various deductions from fundamental principles. He also presents some valuable psychrometric tables for use in practice.—C. P. Y.

COMPARATIVE TEMPERATURES WITH VARYING AIR MOVEMENTS UNDERGROUND. *E. C. Ranson. Jour. Chem., Metall. and Min. Soc. So. Africa, Sept., 1930, vol. 31, pp. 68–72 (discussion pp. 72–75).*

As mining operations descend to great depths there is a rise in rock temperature which causes an increase in the temperature of the ventilating current. This has always been a serious problem for mining engineers because it limits the depth at which mining operations can be carried out safely and economically.

This paper gives valuable data on the extent to which the air is heated at various depths for different rates of air circulation. The larger the volume of air circulated, or the greater the velocity of the ventilating current, the less heat and moisture the air will take up from the rock and soil, and the higher the cooling effect on the workers. At least, this seems to be true in the Village Deep Mine of the Central Rand, where the data were secured.

According to the author, a 50 per cent. increase in the volume of air taken in for ventilating purposes made possible the extension of mining operations down from a vertical depth of 6,500 feet to one of 7,300 feet without increasing the temperature of the air in the intakes or splits. From these and other data, the author predicts that by doubling the air supply a depth of 8,100 feet may be reached without increasing the temperature of the air in the workings.

Needless to say, these data may not apply directly to other mines. The temperature gradient of the rock, the conditions of the airways with respect to moisture, and possibly other factors may affect the results considerably. The fact that the observations with high and low air flows were made four years apart may in itself be a weak point in the situation, since the surface condition of the airways may have changed in the interim.

There is great need for further observations under more comparable conditions, in order to clarify these exceedingly important points raised by Ranson.—C. P. Y.

MEASUREMENTS OF SKIN TEMPERATURE OF MEN AT REST AND AT WORK UNDER THE INFLUENCE OF LOW AIR VELOCITIES. ALSO A CONTRIBUTION ON THE KATA-THERMOMETER. *W. Liese. Arch. f. Hyg., July, 1930, vol. 104, pp. 24–42.*

Observations of surface temperatures on a single subject indicate that uncomfortable sensations of warmth are produced when the temperature of the forehead rises to 34°C. with body surfaces in a state of insensible perspiration. A forehead temperature of 34°C. resulted from exposure to an air temperature of 28.5°C. while at rest, and to a temperature of 30.5°C. during work (1,300 kgm. in one-half hour), the air movement being kept at 0.4 meter per second in both cases. The corresponding cooling powers of the air were about 2.5 millicalories per square centimeter per second on the dry kata, and 14.5 millicalories on the wet kata. The effective temperature was 24.5°C., and the wet bulb temperature was 20°C. at rest and 23°C. at work.

A normal forehead temperature of 32°C. was found to correspond to a dry kata cooling power of 5 and 6, at rest and at work respectively, a wet

kata cooling power of 22 and 24 (at rest and at work), an effective temperature of about 21.5°C. at rest, and a wet bulb temperature of about 20°C. at work and 17°C. at rest.

From these and other intermediate data, the author concludes that the cooling power of the air on the kata-thermometer does not always correspond with the cooling of the human body, owing to physiologic changes which play an important and decisive rôle.

Air velocities between 0.2 and 0.5 meter per second were found to exert some influence on the forehead temperature, but velocities under 0.2 meter per second had practically no effect. These threshold values of air currents seem to be fairly in accord with those reported by Baetjer (Baltimore, Md.). The variation in these earlier American results was from 0.15 meter per second to 0.65 meter per second in air temperatures of from 12°C. to 30°C.

It is of interest to compare Liese's results with those recently obtained by Ward in the United States. In Ward's experiments an optimum sensation of comfort was experienced when the temperature of the forehead and carotid were between 33°C. and 34°C. These corresponded to a dry kata cooling power of about 4 and an effective temperature of about 18.5°C. Uncomfortable sensations of warmth were reached when the surface temperatures rose to 35°C. or 36°C., with a dry kata cooling power of 1.7 approximately, and an effective temperature of about 25.5°C. Uncomfortable sensations of cold, on the other hand, were experienced when the skin temperature fell to 31°C. or 32°C., corresponding to a dry kata cooling power of about 6 and an effective temperature of about 14°C.

These values seem to be appreciably higher than those of Liese, owing probably to inherent individual variations in the subjects of the experiments and to the degree of acquired adaptation. The fact that Americans are, as a general rule, acclimatized to higher temperatures than the Europeans may in itself explain the difference in the results.

Contrary to expectation, the fall in the forehead temperature during work, in Liese's experiments, is in all probability a real one. Such a drop was recently reported by Benedict (Boston, Mass.) and has been confirmed by unpublished laboratory and field data on two other groups of workers.

A few exceptions may be taken to this report of Liese's, but the field is comparatively new, and further experiments are contemplated to clear the obscure points.—C. P. Y.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

A Health Program for Community and Industry. *B. Fuller. Pub. Health Nurse, Jan., 1930, vol. 22, pp. 9–11.*

Health work at the Pacolet Mills, South Carolina, dates back to 1916, at which time the first industrial nurse in that part of the country was hired.

Today there is a health center and small hospital with three nurses, a dentist, and a physician. Physical examinations are required of all employees on their entrance to the mills. First aid and hospital care are free but employees pay their own doctor and medicine bills. Clinics for babies and children of school age, as well as a prenatal clinic, are held every week. Classes are taught in home hygiene and the care of the sick. Campaigns are carried on for the purpose of interesting children in eating more vegetables by planting their own gardens. In this way the number of cases of pellagra in the community has been decreased.

HEALTH AND LABOR TURNOVER IN A DEPARTMENT STORE. *C. J. Ho. Personnel Jour., Oct., 1930, vol. 9, pp. 216–221.*

"The relation of health to labor turnover was studied on the basis of the experience of a department store for five years. It was found that on the average 7 per cent of all separations each year are caused by health reasons.

"Different departments vary in proportion of health cases. In the selling departments studied an average of 11 per cent of all separations were for reason of health, while the non-selling departments range from 5 to 8 per cent. Among the selling departments, those having unfavorable location and physical conditions have greater proportions of health cases.

"Health cases are more frequent in the spring than in the fall. On the average of the five years, there were 9 per cent in the first half of the year but only 6 per cent in the second half.

"Women more frequently leave because of health conditions than men. One man was found in a hundred separations due to health, while 25 per cent of all separations were men and 75 per cent women.

"The management is responsible for the health cases whether they are due to individual constitutions or environmental conditions. Practical measures such as health education, adjustments, selection, study of physical conditions and periodic physical examinations are suggested."

REHABILITATION OF DISABLED EMPLOYEES

SALVATION THROUGH WORK. *E. Hochhauser. Abstr. from Pub. Health Nurse, March, 1930, vol. 22, pp. 144–146, in Occup. Therapy, June, 1930, vol. 9, p. 189.*

This is an interesting account of the work of the Altro Workshop, with brief summaries of several cases. It has been stated that were there more workshops like the Altro, sanatoriums for the tuberculous could discharge 20 per cent. of their patients who now must be held until convalescence is well established. By good business management the work is largely self-supporting even though the patients receive a wage comparable to that received in industry. It is a dream that the demand for Altro garments will so increase that additions to the plant may be made and the work extended to cardiacs, nephritics, and others who are able to do only part time work.

INDUSTRIAL MORTALITY AND MORBIDITY STATISTICS

STATISTICAL METHODS FOR MEASURING OCCUPATIONAL MORBIDITY AND MORTALITY. *Internat. Labour Office, Studies and Rep., Series N (Statistics) No. 16, 1930.*

Anyone unfamiliar with the difficulties associated with estimations of occupational morbidity and mortality will find them clearly and carefully stated in this publication issued from Geneva. Stress is laid on the need for making allowance for the age and sex of those concerned, and also for the marital condition. Race and nationality, and also social status and the density of the population, are other factors which may exert a modifying influence before the question of occupational environment can be approached. Different occupations attract men of different physique; occupations with the most distinct occupational risks are not recruited from the lowest social classes. Such classes consist of occupations, the excessive mortality of which is due largely to the low standard of life, or, in other words, to indirect occupational conditions arising from negative selection in the choice of occupation. The adverse effect of occupation may appear quickly when the recruit is not yet adapted to his environment; on the other hand, it may appear only after years, owing to the appearance of some slowly developing occupational disease. Again, occupations requiring little skill and strength are a pool where weaker workers, driven out of other occupations, gather; here morbidity may be high, not because the occupation is strenuous, but because it is *not* strenuous.

Throughout this study reference is made to data collected in several different countries; but special stress is laid upon the occupational mortality figures for England and Wales, wherein special attention is paid to an occupational classification of the populations studied. Throughout, data regarding mortality are more reliable than those for morbidity, and more capable of being compared internationally. Sickness records, as far as possible, should be classified to correspond with the international list for mortality. Sickness is usually based upon claims for sick benefit, which are known to vary with the economic position prevailing at any time; more claims are made for minor sickness in time of depression than in times of good trade.

Stress is laid throughout upon the need for considering data distributed according to age; standardization for age in order to produce a single figure is rightly looked upon with disfavor. The reasons for this conclusion are cleverly set out in the last chapter, in which a study is presented of the age curve of excess of morbidity and mortality based on various national records. The method of study adopted is to examine any excess of mortality or morbidity throughout life, when three main groups of excess curves can be distinguished. In the first group, wherein the industry exerts no selection upon its recruits, the tendency is for any excess to show as a long and gradual rise during life. In the second group, where, owing to the heavy physical work, selection is positive and attracts the physically strong, the tendency is for any excess to show

again as a long, but this time as a steep, rise throughout life. For the third group, where the selection is negative, which means that the weaklings are attracted owing to the lack of physical effort, the excess shows itself as a long, but gradual fall. Taken as a whole, where the occupational danger is considerable, the excess curve is decidedly convex; that is to say, in the case of a rising excess curve by ages, the excess can be assumed to be due to occupational factors. This method of study is one of great interest, and the instances quoted in its support should be examined by all.

So far, sickness and morbidity have been considered as a whole, but attention is drawn to the age curves of excess mortality and morbidity by diseases, since certain diseases are known to prevail mainly at certain ages; tuberculosis, for instance, at younger ages, while cancer and cerebral hemorrhage attack at older ages. Interference with the shapes of the curves so introduced, is, however, largely allowed for by studying only excess mortality and morbidity. It is concluded that, though each disease has a more or less typical movement for its excess curve, the excess curve is, in each occupation, modified by the selective forces. On the whole an excellent case is made out for the claim that calculation of death rates and sickness rates for ages, and their comparison by a common standard, constitute the best method of arriving at statistical conclusions of occupational health.—E. L. C.

J. I. H.
April, 1931

ABSTRACT OF THE LITERATURE
OF
INDUSTRIAL HYGIENE

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GENERAL

REPORT OF THE MEDICAL RESEARCH COUNCIL FOR THE YEAR 1929–1930. *H. M. Stationery Office, 1931, pp. 138.*

One group of research undertaken by the Council was devoted entirely to industrial health. It included extended study of occupational pulmonary troubles through animal experiments and by research into asthma among cotton strippers; investigations into miners' nystagmus; and the activities of the Industrial Health Research Board, which receive special reference from time to time through their own annual reports. Certain statistical studies were made of sickness among operatives in the cotton mills, and among workers in other industrial and clerical establishments. Apart from this group of investigations, many other subjects of research during the year were of interest directly or indirectly to industrial hygiene, such as vision in relation to glare, and the best illumination for visual acuity; hearing in connection with the effects of ear defenders and the output of weavers working in a noisy shed; and the influence of irradiation on resistance to infections, and of Vitaglass in factories on output.—E. L. C.

INDUSTRIAL MEDICINE IN RELATION TO PUBLIC HEALTH. *L. P. Lockhart. Jour. Roy. San. Inst., March, 1931, vol. 51, pp. 501–509.*

This is a thoughtful address, in which the place and value of industrial medicine in modern social life is represented as becoming a decisive factor in ameliorating human inefficiency, and leading to national wealth, which is founded on industrial health. —E. L. C.

PROBLEMS OF INDUSTRIAL MEDICINE. *C. S. Gorsline. Michigan State Med. Soc. Jour., Aug., 1930, vol. 29, p. 576.*

RELATION BETWEEN PHYSICIAN AND INDUSTRY. *H. S. Collisi. Michigan State Med. Soc. Jour., Dec., 1930, vol. 29, p. 904.*

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

THE EXPERIMENTAL PRODUCTION OF BLADDER TUMORS. *W. Schär. Abstr. as follows from Deutsch. Ztschr. f. Chir., 1930, vol. 226, p. 81, in Am. Jour. Cancer, Jan., 1931, vol. 15, pp. 318–319.*

Attention was first called to the carcinogenic quality of some of the aromatic products of coal tar with the observation of Rehns in 1895 that an unusual frequency of bladder tumors was observed in aniline dye workers. The conditions for the formation of aniline tumors are: first, sensitivity of the individual; second, long-continued occupational contact with these substances. The minimum period which has been observed is two years and in some cases the exposure has been as long as thirty-five years. The tumors appear in the relatively younger age groups, for example, 30 to 40, and especially in those workers who have been in the aniline industry from youth.

Schär attempted first the production of tumors by the inhalation of certain aromatic amino compounds. Naphthylamine was selected. Young rabbits of the same litter were placed in boxes through which a stream of air was blown carrying the substance employed. The animals were exposed continuously but occasionally were exposed to fresh air. The rabbits died and postmortem examinations showed a chronic productive interstitial nephritis. The lungs were the site of a chronic bronchitis and a chronic interstitial pneumonia. In the animals which lived for a year, the bladder showed definite changes: the epithelium was altered from the normal transitional type to a squamous type with considerable proliferation. At the same time the connective tissue was increased and more dense, and in the stroma there was a round-celled infiltration. This influence of the chronic irritation of the poison on the bladder mucous membrane led in two of the animals which lived the longest to tumor formation. In one animal treated with alpha-naphthylamine a pedunculated polyp developed after twenty months' exposure. Another animal surviving two years' exposure to beta-naphthylamine showed several papillomas in the bladder, one of which gave microscopic evidence of malignancy. The epithelial cells penetrated the connective tissue in the wall of the bladder, scattered nests of cells were present in the stroma, and the lymph vessels

showed epithelial invasion. It would seem as though the result demonstrated the causal relationship between these tumors and the naphthylamine inhalation, for prior to the present study bladder tumors have not been observed in rabbits.

THE DISAPPEARANCE OF CHIMNEY SWEEPS' CANCER. *L. E. Richter. Abstr. as follows from Ztschr. f. Krebsforsch., 1930, vol. 31, p. 565, in Am. Jour. Cancer, Jan., 1931, vol. 15, pp. 368–369.*

Though chimney sweeps' cancer was of frequent occurrence in England in the previous century and is still occasionally seen, in Germany it has now practically disappeared, and no case has been recently reported. The writer believes that the cause for this is in the greater cleanliness of the chimney sweeps and their protection by the clothes which they wear. Whether the type of coal has anything to do with the matter cannot be decided, though possibly there is some special toxic product in English coal. Statistics for 1890 to 1905 in England showed that skin cancer was eight times as frequent in chimney sweeps as in the average male population. While soot cancer has become a rarity, chimney sweeps' cancer has disappeared in Germany.

RELATION BETWEEN OCCUPATION AND CANCER. *E. Jacobs. Ztschr. f. Krebsforsch., Sept. 24, 1930, vol. 32, p. 469.*

OCCUPATIONAL CARCINOMA OF THE HAND. *A. A. Epstein. Voprosy Onkologii, 1930, vol. 3, p. 79.*

CHANGES IN THE RED CORPUSCLES OF OCCUPATIONAL ORIGIN. *A. Langelez. Bruxelles-Méd., 1931, vol. 11, pp. 479–487.*

A useful summary is presented of the various ways in which the blood may be affected by occupational hazards. First there are the poisons, which may be grouped according as they act directly on the elements of the blood or are carried by the blood to affect other parts of the body. Some poisons act by setting up hemolysis with the formation of hemoglobin; arseniuretted hydrogen is the type. This gas may be set free in various industries, but particularly when ferrosilicon of certain strengths becomes moist. Travelers on ships carrying it as a cargo have been killed by the gas, which may reduce the proportion of hemoglobin to 20 per cent., and the number of red cells to 1,500,000. The blood formula in this case is altered but little. Phosphoretted hydrogen has a similar industrial origin; it has no action on the blood cells. Benzene is largely used as a fat solvent; it causes anemia, with multiple hemorrhages in the skin, an early sign of which is leukopenia with diminution in the amount of hemoglobin. Some poisons act by causing hemolysis, with the formation of methemoglobin and hematin; aniline is an instance in point. It sets up cyanosis and nervous phenomena. In chronic cases, anemia appears, with diminution in hemoglobin and red cells, and also with hemoglobinuria.

Other poisons are characterized by changes in the blood formula. This group includes such metals as lead, mercury, and antimony. Exposure to lead causes first absorption, then

impregnation when signs can be detected, and thirdly, poisoning with definite and subjective symptoms. Blood changes occur, but are not constant; the most definite of these is the appearance of basophil red cells. Their presence is significant when the proportion reaches 100 per million red cells. In chronic cases the administration of iodide of potash may cause these cells to appear in the blood.

Carbon monoxide is a unique blood poison, which acts by uniting with hemoglobin and interfering with the oxygen carrying property of the blood; it does not alter the blood formula. It may cause acute or chronic symptoms, according to the type of exposure. Sulphuretted hydrogen and hydrocyanic acid act in a somewhat similar way. Certain blood changes follow from causes other than poisons, such as ankylostomiasis, or exposure to X-rays or radiations from radium or thorium.—E. L. C.

CONSECUTIVE READINGS OF PULSE RATE ON SMALL GROUP OF CLERKS. *R. H. Britten and C. R. Wallace. U. S. Pub. Health Rep., Dec. 19, 1930, vol. 45, pp. 3128–3135.*

The interest of this paper for the physician or physiologist lies in its determination of the variation of the pulse rate in the same individual and the extent to which different persons manifest the same or dissimilar tendencies. The group studied consisted of eleven men and eleven women, apparently well, performing work of a clerical nature. Approximately 120 readings of pulse rate were taken on each person in the morning, either on consecutive days or three days a week.

The probable errors of the individual readings were calculated for each individual, the average for all persons being about four beats per minute. Thus, one-half of the readings would be expected to be at least four beats per minute greater or four beats per minute less than the average. Also readings deviating as much as ten or fifteen beats per minute from the true average might occasionally be expected without having any particular significance. Although this statement is true on the average, quite different results were obtained for many individuals, some showing much greater variation, others much less. The individual having the broadest variation showed a probable error of between six and seven beats per minute. The amount of variation from day to day among men seemed about equal to that among women.

Comparison of variation from day to day on single individuals with that from one person to another indicated that the two were of the same order of magnitude.—*Authors' Summary.*

NERVOUS SEQUELAE OF TRAUMA. *M. Reichardt. Med. Klin., Sept. 12, 1930, vol. 26, p. 1359.*

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

PERMEABILITY OF SKIN FOR BENZINE AND BENZENE. *N. Lazarev, A. Brusilovskaya, and F. Livshits. Vrach. Gaz., Oct. 31, 1930, vol. 20, p. 1513.*

IS THE TECHNICAL USE OF CARBON TETRACHLORIDE ATTENDED WITH DANGER TO HEALTH? *K. B. Lehmann. Abstr. as follows from Zentralbl. f. Gewer-*

behyg., May, 1930, N. S. vol. 7, pp. 123–133, in Bull. Hyg., Jan., 1931, vol. 6, p. 20.

K. B. Lehmann deals fully with this subject (to which he and his pupils have previously devoted experimental study) in view of its wide industrial use in: (1) degreasing metal parts; (2) extraction of vegetable and animal fats, *e.g.*, from bones and seeds; (3) chemical cleaning of dirty clothes either in closed apparatus or by rubbing with cloths dipped in carbon tetrachloride; (4) admixture with soaps; (5) as a solvent for rubber in making rubber solutions and for diluting sulphur chloride (which is highly inflammable) in vulcanization; (6) as a constituent of lacquer owing to its property of dissolving resins; and (7) as a vermicide when taken internally.

He emphatically condemns its use as a means of destroying pediculi although he describes the treatment for this purpose of 279 children in his Institute with, in only a few cases, a slight state of excitation quickly disappearing at the open window.

In its use in all the operations named, as far as possible, the substance should be used in closed apparatus and this is now generally effected. If this is impossible, then exhaust ventilation must be locally applied. Lehmann discusses: (1) the qualitative and quantitative toxicity of carbon tetrachloride in experiments on man and on animals; (2) the possible occurrence of decomposition products in its use from heat, as in certain fire extinguishers, and mentions the kind of fires (benzine, benzene, naphthalene, petroleum, celluloid, and oil) in which such extinguishers are particularly suitable; and (3) the seriousness of the danger of the actual products of decomposition, chlorine, hydrochloric acid, and phosgene, given off under the circumstances. Here he insists on the grave risk from these gases in the use of carbon tetrachloride extinguishers in fires in confined spaces—T. M. L.

HEALTH CONDITIONS IN CHROMIUM PLATING ESTABLISHMENTS. *Förster. Zentralbl. f. Gewerbehyg., Oct., 1929, N. S. vol. 6, pp. 291–292.*

ON THE ACUTE EFFECTS OF CHROMIC ACID MIST. *L. Schwarz and F. Sieke. Ibid., Aug., 1930, pp. 232–234.*

Abstracted as follows in Bull. Hyg., Dec., 1930, vol. 5, pp. 926–927.

[For the last seven years cases of this condition have been reported, due to the bubbles of hydrogen bursting on the surface of the chromium plating bath and carrying a mist of chromic acid up to the breathing level. The remedy so far generally adopted has been locally applied exhaust ventilation, but this is not always satisfactory.] Förster describes here, for the first time, another method: that of covering the surface of the liquid with a layer of petroleum or the higher homologues of benzene. Unfortunately, such a mixture has a flash point of about 53°C. and it evaporates rapidly. While obviously some superficial layer which would prevent the bubbles of hydrogen bursting at the surface would be a most excellent way of overcoming the risk, Förster emphasizes the danger of such a liquid as this, not only from the point of view of fire, but from the risk of chronic benzene poisoning. These are indeed said to have occurred.

Schwarz and Sieke give particulars of five cases which they diagnosed as "catarrh of the throat with slight bronchial catarrh." In addition in three, there was slight conjunctivitis

and in two, increased blood pressure. [It is obvious, from this diagnosis, that the serious import of the symptoms had been overlooked.]—T. M. L.

THE TRANSPORTATION AND STORAGE OF FERROSILICON FROM THE POINT OF VIEW OF PUBLIC HEALTH. *F. Bordas. Ann. d'hyg. pub., indust. et sociale, Jan., 1931, vol. 9, pp. 1–14.*

This is an expression of the author's opinion with regard to dangers which may arise from moving or storing ferrosilicon in France. Today France produces and exports ferrosilicon, which a few years ago she obtained from abroad. Various strengths of ferrosilicon are made, varying from 10 to 98 per cent. of silicon. The product contains as impurities phosphides and arsenides arising from raw materials. Samples which contain about 50 per cent. of silicon tend to undergo disintegration, particularly when exposed to moisture; under these circumstances phosphoretted hydrogen and arseniuretted hydrogen are generated. Cases of serious and fatal gassing have arisen from time to time from this cause.

The author points out that if the proportion of silicon is below 30 or above 70 per cent., the alloy is stable and does not tend to disintegrate even with damp. Hence he considers that so long as such stable alloys are used, no particular precautions are needed to govern either transport or storage. Moreover, he is of the opinion that the trade uses only the intermediate samples because of old-time custom, and that their use might be discontinued. If, however, intermediate samples containing about 50 per cent. of silicon are to be stored or transported, the utmost care is needed to keep them dry. On board ship they should not be placed in holds, which are always damp, but should be carried on the deck, and the barrels carefully covered. In every case the receptacles containing such samples should be clearly labeled, and the possible dangers from damping should be indicated. Ferrosilicon is now seldom used in the manufacture of hydrogen for airships.—E. L. C.

FURFURAL AS AN INDUSTRIAL POISON AND ITS DETERMINATION IN THE AIR. *J. M. Korenman and J. B. Resnik. Arch. f. Hyg., Sept., 1930, vol. 104, pp. 344–357.*

The increasing use of furfural in chemical manufacture is noted and the point is made that it is slightly injurious. The authors have improved the colorimetric method of Tolman and Trescot and of Mohler. The air is passed through Drechsel wash bottles containing distilled water at the rate of 8 to 10 liters per hour. The contents of the wash bottles are collected, 0.5 c.c. of aniline and acetic acid reagent is added, and the intensity of the rose-red color is matched against known amounts of furfural in similar volumes of liquid. The depth of color is proportional to the amount of furfural. It was found that alcohol is a better absorbent in some respects, as the color seems to be more distinct.—L. T. F.

THE EXECUTION OF ROBERT H. WHITE BY HYDROCYANIC ACID GAS. *E. E. Hamer. Jour. Am. Med. Assn., Aug. 30, 1930, vol. 95, pp. 661–662.*

Robert H. White was executed by hydrocyanic acid gas at the Nevada State Prison, June 2, 1930. A study

of the heart and respiratory action was made at the time of the execution, a Bowles stethoscope being applied on the bare chest wall over the apex of the heart. The tube leading to the ear pieces on the outside of the prison wall was connected to the stethoscope while the prisoner was being strapped to the chair.

This was at 4:36 A.M. The heart action at that time was 108, strong and regular. The gas was started generating at 4:37½. At 4:38 the pulse rate was 120, regular and strong. A small inspiration was taken at 4:37¾, at which time the prisoner indicated that he smelled the gas. At 4:38 he took a very deep inspiration, turning his head toward the gas. He gave a spasmodic cough, his head fell forward, and he became unconscious. Following this first deep inspiration there was a complete stopping of the heart action for fifteen seconds. After that short period of time, or at 4:38½, the heart again began to beat in an irregular manner, continuing thus for fifteen seconds, when it became regular and strong. There was no apparent loss of power in the heart action. After this time, for two minutes the heart became slower, beating 100 times a minute at 4:41½ and eighty times a minute at 4:44. At 4:46½ the heart beats were distinctly regular but becoming very weak. The last heart beat was noted at 4:47.

Respirations during this time after the first deep inspiration were convulsive and irregular.

There is no doubt that the prisoner was unconscious after the first deep inspiration. His head was thrown backward and remained in that position until after the fifth or sixth inspiration, or for two minutes, when it fell forward and there was no further movement of the head.—C. K. D.

LEAD POISONING IN NEW YORK STATE. A STUDY OF THE HEALTH OF 381 LEAD WORKERS. *N. Y. State Dept. Labor, Bur. Indust. Hyg. Bull., 1928, pp. 167.*

The material in this bulletin is presented in nontechnical terms, as far as possible, so that it will be at the disposal of laymen as well as physicians who are faced with the practical problem of protecting lead workers. It covers the following topics: basic chemical and physiologic reactions of lead in the body; clinical and laboratory evidences of lead poisoning; diagnosis of lead poisoning and lead absorption; analysis of the physical examinations of 381 lead workers; lead poisoning and compensation; prophylaxis and treatment of lead poisoning and lead absorption. Of special interest are the results of the physical examinations. These are summarized as follows:

1. Three hundred and eighty-one lead workers were examined. They were all at work when the examinations were made, so that there were no cases of acute lead poisoning in the present series.

2. These men were taken from twenty-five plants in fifteen of the lead industries of the state of New York.

3. They were exposed to lead in the following forms:

Lead fumes
Red lead paste
Red lead and litharge dusts
Dry and wet paint
Dry and wet chrome colors
Dry and wet pottery glaze
Pig lead
Metallic lead dust
White lead dust

4. The following age groups were represented:

Age Group	*No. of Cases*
Under 16 years	1
16 to 18 years	16
19 to 21 years	29
22 to 30 years	108
31 to 40 years	116
41 to 50 years	66
51 to 60 years	27
Over 60 years	18
Total	381

5. The workers examined were exposed to lead for the following periods of time:

Duration of Exposure	*No. of Cases*
Under 2 months	28
2 to 6 months	57
7 to 11 months	21
1 to 2 years	72
3 to 5 years	86
6 to 10 years	36
11 to 15 years	28
16 to 20 years	19
21 to 30 years	25
Over 30 years	9
Total	381

6. For purposes of standardization, both of terminology and diagnosis, the term "lead absorption" has been arbitrarily reserved to describe all cases in which there was laboratory evidence that lead was being actively absorbed (active cases), as well as those cases in which the presence of the lead line demonstrated that lead had been absorbed at some previous time (inactive cases). This was done quite regardless of whether or not these cases gave clinical manifestations of the disease. The term "lead poisoning" has been applied to those cases of "lead absorption" presenting toxic episodes, such as acute lead colic, lead palsy, or lead encephalopathy. It is believed that, were this terminology generally accepted, much would be accomplished in the direction of standardizing the diagnosis of this disease. The urgent need for standardization of diagnosis is discussed.

7. There were 232 cases of lead absorption found, which was 80.8 per cent. of the 381 lead workers examined. Of these, 222, or 58.2 per cent., were active cases, while ten, or 2.6 per cent., were inactive. The highest incidence of lead absorption was found among lead burners—these workers being exposed to lead oxide fumes.

8. The presence of lead was demonstrated in the noses of 116, or 30.4 per cent. of all the workers examined. The highest incidence occurred in mixers of dry chrome colors. Lead in the nose could not be demonstrated as often as was expected, and the presence of lead in the nose did not seem to indicate that any of it was necessarily being absorbed.

9. There were in all thirty-one cases with lead line in the gums. Ten of these had no laboratory evidence of active lead absorption and were classified as inactive cases. Careful laboratory examinations, both of blood and of urine, are required for a proper interpretation of the significance of the lead line in any given case. It must always be determined whether the lead line in the particular case in which it was observed was the result of active lead absorption at the time it was observed, or whether it merely represented a storage of lead sulphide which had been deposited there at some previous time and which was inert at the time it was observed. The lead line must be differentiated from cyanosis of the gums.

10. Gastro-intestinal disturbances suggestive of lead absorption were found in 192, or 50.3 per cent. of all the workers examined. Of these, there was laboratory evidence of lead absorption in 136 cases. The remaining fifty-six cases gave no laboratory evidence that lead was actually being absorbed at the time the examinations were made.

11. Disturbances referable to the nervous system were found in 143 cases, or 37.5 per cent. of the total. There was laboratory evidence of lead absorption in ninety-seven of these cases. The remaining forty-six cases gave no laboratory evidence that lead was being actively absorbed, at the time the examinations were made.

12. Disturbances referable to the skeletal system (muscles and joints) were found in forty-two cases, or 11 per cent. of the total. There was laboratory evidence of lead absorption in twenty-eight of these

cases. The remaining fourteen cases gave no laboratory evidence that lead was actually being absorbed at the time the examinations were made.

13. Lead pallor was found to have no relation to the hemoglobin content of the blood and was thought to be due rather to a neurovascular disturbance resulting in a constriction of the capillary circulation.

14. Careful laboratory analyses of the blood pictures of the workers examined revealed a type of anemia in which stippling of the red blood cells appeared to be only one of many important features, the presence of which did not appear to be essential to a diagnosis. The principal characteristics of lead anemia may be summarized as follows:

a. The red blood cell count and hemoglobin are only slightly reduced in all but severe cases, giving the appearance of a very low grade secondary anemia.

b. The color index is in the average case only a little less than 1, although it gets lower as the red cell count and the hemoglobin are reduced.

c. This apparently low grade anemia is associated with changes in the morphology of the red cells, which are out of all proportion to what would be found in the ordinary case of secondary anemia of the same severity. Of these blood changes, stippling ranks fourth in frequency, having been demonstrated in 39 per cent. of the cases showing blood changes and 24 per cent. of the total cases.

d. Stippling of the red cells, though more prevalent in this anemia than in other secondary anemias, is only one of a number of pathologic blood changes and must be considered in conjunction with the rest of the blood picture if its true significance is to be appreciated.

e. Stippling and polychromatophilia occur in approximately the same percentage of cases, though they frequently occur one without the other.

f. The white cell count is normal, but there is a slight relative lymphocytosis at the expense of the polymorphonuclear leukocytes. The average lymphocyte count was found to be 39 per cent.

g. The mononuclear cell count was found to be somewhat increased, the average for the series being 6 per cent.

h. The diagnosis of lead anemia must depend upon a careful examination of the whole blood picture. It is desirable that here, as in the other anemias, more than one slide be examined since many of the abnormal cells, particularly stippling, appear in the circulation only intermittently.

15. The laboratory revealed 148 cases of lead anemia and 116 cases with lead in the urine.

16. Arteriosclerosis was present in eighty-six men, constituting 22.2 per cent. of the total. Careful analysis would seem to indicate that the incidence of arteriosclerosis tended to be high among all of the men in the social and economic classes from which lead workers appear to be recruited, rather than that there was any close relationship between this high incidence and prolonged exposure to lead.

17. Hypertension was found in ninety-eight cases—25.1 per cent. of the total workers examined. Of these, sixty-six were cases of hypertension without an associated arteriosclerosis, 14 per cent. of which occurred in workers under 30 years of age. It is felt that the action of lead on the neurovascular system, tending to cause constriction of the capillary circulation (such as is believed to be responsible for the production of lead pallor) may, perhaps, be sufficiently extensive to be responsible for the type of hypertension found among these workers.

18. Nocturia (regarded as significant as an index of renal insufficiency) was found in fifty-seven cases, or 14.9 per cent. of the total; while albuminuria was found in forty-eight, or 12.5 per cent. of the men examined. Since both alcoholism and the high incidence of arteriosclerosis in the social and economic classes from which lead workers appear principally to be recruited, are such important factors in the production of renal disturbances, no conclusions could be drawn from the present series as to the part played by lead in the present instance. The doubt, already expressed, as to the relationship between arteriosclerosis and prolonged exposure to lead still further complicates the issue. A much larger series would be

required properly to relate these several factors.

19. Workers under 20 years of age appeared to be more susceptible to lead than the older men.

20. Laboratory analyses, both of blood and of urine, are an essential part of the physical examination of every lead worker. Recognition of this fact is absolutely essential, if the numerous mistakes in diagnosis which now occur are to be reduced to a minimum. In the examination of the 381 lead workers there were 149 cases suspected of active lead absorption on physical examination. In the case of thirty-nine, or 26.1 per cent. of these cases, when analyses were made of the blood and urine and the cases were reviewed on the basis of the complete findings, it was considered that the tentative clinical diagnosis was incorrect. There were 232 cases, on the other hand, which gave no clinical suggestion whatever of lead absorption and yet laboratory analyses of blood and urine showed that 112 or almost half had definite evidences of active lead absorption.

QUANTITATIVE DETERMINATION OF LEAD IN FECES AND URINE AND ITS SIGNIFICANCE IN THE DIAGNOSIS OF LEAD POISONING. *F. Fretwurst and A. Hertz. Arch. f. Hyg., Sept., 1930, vol. 104, pp. 215–225.*

The authors claim that quantities of lead up to 0.14 mg. per 100 gm. of feces and 0.07 mg. per 1,000 c.c. of urine are of no significance for the diagnosis of doubtful cases of lead poisoning even though these amounts are excreted by persons not exposed to lead.

Extraordinary amounts of lead were found. Individuals who were in no way in contact with lead showed from 0 to 0.14 mg. of lead per 100 gm. of feces. In one case 0.6 mg. per 100 gm. of feces was found. The urines contained 0.01 to 0.07 mg. of lead per 1,000 c.c.

Individuals who had worked with lead but had never shown any signs of poisoning showed from 0 to 0.2 mg. of lead per 100 gm. of feces and from 0 to 0.13 mg. per 1,000 c.c. of urine. Lead workers showing signs of poisoning had from 0.02 to 0.9 mg. of lead per 100 gm. of feces and from 0 to 0.13 mg. per 1,000 c.c. of urine.

Lead was also found in the hospital drinking water in significant amounts (0.03 mg. per liter) and the city supply of Hamburg contains 0.07 mg. of lead per liter of water.—L. T. F.

EXCRETION OF LEAD IN URINE AND FECES OF PATIENTS INJECTED WITH COLLOIDAL LEAD. *R. K. Newman. Abstr. as follows from Med. Jour. Australia, June 14, 1930, vol. 1, p. 781, in Jour. Am. Med. Assn., Aug. 23, 1930, vol. 95, p. 629.*

The results of the examination made by Newman of the excretion of lead following injections support the belief that the therapeutic action of the lead is a quantitative rather than a qualitative one. At the average rate of excretion found it would take more than ten weeks for the complete excretion of a single injection of 50 mg. of lead, and for most of that period the lead concentration in the urine and therefore probably in the blood also would be approximately of the same order as that found in cases of lead poisoning. Clinical experience has shown, however, that this concentration is not sufficiently great to produce therapeutic results, since injection of 50 mg. at infrequent intervals is not satisfactory; in fact, it appears to be necessary to inject at comparatively frequent intervals to secure results. Under these circumstances the average concentra-

tion of lead in the urine and in the blood throughout the period of treatment would probably approximate to the maximum in the cases investigated in this work. Newman suggests that the dose and the frequency of injection in each person treated should be determined by reference to the concentration of lead in the urine, lead being administered as necessary to keep this figure between 0.5 and 0.1 mg. per liter for as long as the body can tolerate it. There is ample evidence to show that cancer growth may continue uninterruptedly in bodies with considerable quantities of lead locked up in the tissues.—C. K. D.

ROENTGEN SIGN OF PLUMBISM: LEAD LINE IN GROWING BONE. *E. C. Vogt. Abstr. as follows from Am. Jour. Roentgenol., Nov., 1930, vol. 24, p. 550, in Jour. Am. Med. Assn., Jan. 31, 1931, vol. 96, p. 367.*

"A constant finding was the dense zone at the growing edges of the bones, which was usually evident adjacent to any epiphysis but most marked at the end of long bones of the extremities and at the anterior ends of the ribs." Eight cases of clinical lead poisoning showed this sign.—C. K. D.

FATAL POISONING OF NITRIC ACID WORKERS BY NITROGEN OXIDE FUMES. (A CONTRIBUTION TO THE KNOWLEDGE OF ZENKER'S DEGENERATION OF THE HEART, BRONCHITIS, BRONCHIOLITIS OBLITERANS AND MILIARY CARNIFYING PNEUMONIA.) *O. Schultz-Brauns. Abstr. from Virchows Arch. f. path. Anat., 1930, vol. 277, pp. 174–220, in Ber. ü. d. ges. Physiol. u. exper. Pharmakol., Nov. 5, 1930, vol. 56, p. 610.*

The author discusses nitrogen oxide poisoning especially from the anatomic-pathologic standpoint, and describes in detail three fatal cases which he had the opportunity to observe. The number of cases of poisoning that have occurred is certainly greater than is ordinarily believed. Over 150 fatal cases have been collected from the literature.

Nitrogen oxide poisoning is surprisingly like war gas—especially phosgene—poisoning. This similarity is apparent not only in the histologic and clinical picture but also in the period of time in which death ensues, as is shown by the following:

Period in Which Death Occurs	*Phosgene (Groll)*	*Nitrogen Oxides*
hrs.	*%*	*%*
0–24	58	56
25–48	24	27
49–72	10	10
Over 72	8	7

For differential diagnosis influenza pneumonia as well as miliary tuberculosis must be considered. Just as in phosgene poisoning, at first superficial degenerative and regenerative changes in the lung are most marked, while inflammatory and interstitial changes are less noticeable. With chronic poisoning, bronchiolitis obliterans occurs. Unlike phosgene poisoning, however, nitrous gas poisoning also causes primary heart injury. The occurrence of Zenker's degeneration of the heart muscle in particular indicates that poisons are formed which injure other organs besides the lungs. Also cardiac weakness, which sets in before edema of the lungs occurs and which often lasts for weeks, as well as sudden stoppage of the heart, suggests toxic injury. The course of illness is

probably influenced chiefly by the general effects of poisoning. In one cadaver methemoglobin was found. An extensive bibliography accompanies the article.—L. T. F.

EXPERIMENTAL LIVER NECROSIS FROM SHALE OIL. *C. J. Polson. Jour. Path. and Bacteriol., Jan., 1931, vol. 34, pp. 5–12.*

Liver necrosis was produced in rabbits by administering shale oil intraperitoneally. By graduating the dose, all stages of necrosis could be produced, from the acute up to chronic cirrhosis. The lesions obtained were almost identical with acute and subacute necrosis of the liver seen in human beings. The shale oil proved far less active for rats, which required ten to fifteen times the dose given to rabbits, weight for weight, to produce lesions. No instances are known of human beings experiencing such lesions from occupational exposure to shale oil.—E. L. C.

MODERN ORGANIC SOLVENTS. *H. Zangger. Arch. f. Gewerbepath. u. Gewerbehyg., 1930, vol. 1, no. 1–2, pp. 77–196.*

The author divides the period since 1900 (in which organic solvents have played an industrial rôle) into four distinct divisions. The chemical and physical properties of the known solvents have been collected and are discussed in this article. An interesting and important discussion is given of the neglected field of unusual and rare solvents which are employed in organic laboratories and to which chemists are exposed. The article deals principally with the applications of the solvents in industry and the various regulations which have been promulgated regarding their use. Particular reference is made to the lacquer and color industries because of their tremendous recent development. Formulas and processing are described, statistics of production are given, and a systematic review is made of the means used to combat poisoning, with emphasis upon continual exposure to very small amounts of solvent. This paper is encyclopedic in nature and should prove of the greatest interest to those concerned with the hygiene of modern organic solvents.—L. T. F.

REVIEW OF LITERATURE DEALING WITH HEALTH HAZARDS IN SPRAY PAINTING. *Nat. Res. Council of Canada, Bull. No. 15, 1930, pp. 44. Abstr. as follows in Bull. Hyg., Dec., 1930, vol. 5, p. 926.*

Information, gathered from many sources, is well presented concerning the physiologic effects of the more common constituents of spray paints, and the means for controlling health hazards arising therefrom. Spray paints have come more and more into use in the last twenty years; toxic constituents comprise lead, benzene, silica, and turpentine. These poisons enter the body mostly by inhalation of fine droplets of spray. A summary is given of existing and tentative legislation which concerns mainly the United States and Great Britain. Recommendations are made that toxic ingredients should either be eliminated, or be present in nonpathogenic amounts only; lead, for instance, should not exceed 1 per cent. The contents in poisonous ingredients should be clearly stated on the labels. Spray should be applied in places so constructed that

an efficient exhaust draft carries the spray away from the worker. Articles so painted should be set aside in special apartments to dry. The air pressure in the spray machine should be low; and its nozzle should be held at least 1 foot from the object sprayed. Operators should wear a mask into which fresh air under pressure is discharged, and should be medically examined on engagement and periodically thereafter. An appendix usefully states the effect on the skin of common substances used in paints, varnishes, and lacquers; but this part of the report is sketchy and inadequate.—E. L. C.

RISKS IN NEW METHODS OF WORK—SPRAYING. *W. Rosenthal and E. Rosenthal-Deussen. Abstr. as follows from Deutsch. med. Wchnschr., 1930, vol. 56, pp. 1444–1446; pp. 1487–1489, in Bull. Hyg., Dec., 1930, vol. 5, p. 926.*

This article in two numbers is intended to enlighten medical practitioners in industrial districts where the process of cellulose and other forms of spraying are carried on now in increasing volume, and to indicate what to look for in the way of symptoms. The authors first describe "metallization" in which a metal thread is melted in a blowpipe flame and the molten metal blown under pressure, so as to form a very thin metallic covering over various materials, such as porcelain or wood, to take the place of galvanizing.

Dealing with cellulose spraying they describe the poisonous solvents, such as turpentine and benzene and its much less poisonous homologues, xylene and toluene, and lay particular stress on the dangers of methyl alcohol as likely to produce optic neuritis.

Of poisonous coloring matter, particular mention is made of lead and silica, the latter being now in common use for porcelain enameling of stoves, baths, and cooking utensils. The authors state that X-ray photographs have shown the typical findings of silicosis in workers who have been enameling for years. They deal at some length with the conclusions arrived at by the Committee on Benzol of the National Safety Council as given in their Final Report in May, 1926, regarding the substitution of toluene for benzene.

Finally they lay stress on the value of periodic medical examination and describe the most important symptom, which should lead to suspension in regard to: (*a*) benzene; (*b*) methyl alcohol; (*c*) lead; and (*d*) silicosis. They insist on the need for suspension in the case of benzene if the hemoglobin content is below 70 per cent., the red blood cells below 4,000,000 per cubic millimeter, and the total number of white blood cells per cubic millimeter less than 5,600, or if the number of polymorphonuclears falls below 4,000.

They have decided that only compulsion by the state under regulations will bring about the substitution of toluene for benzene.

[In February, 1930, the government of South Africa introduced a well thought out code of regulations for cellulose spraying to guard against the danger from fumes and also from the risk of fire. No regulations are in force in Great Britain.]—T. M. L.

DUST HAZARDS AND THEIR EFFECTS

CONGRESS OF INDUSTRIAL MEDICINE. *Foreign Letter (Italy), Jour. Am. Med. Assn., Feb. 14, 1931, vol. 96, pp. 542–544.*

This letter contains an account of the Ninth Congress of Industrial Medicine held in Rome. The subject before the Congress—"The Problem of the Respiratory Pathology of Dusts"—was divided into several parts. Caccuri of Naples discussed the etiology and pathogenesis of respiratory diseases due to dust; Coppa of Naples, the pathologic anatomy and the clinical aspects of respiratory dust diseases; Pastena, also of Naples, radiologic research in pneumonokoniosis. Abstracts of these papers are included in the letter. Communications were also presented concerning the respiratory diseases of coal heavers and of workers in hemp.—K. R. D.

ASBESTOSIS BODIES IN THE SPUTUM: A STUDY OF SPECIMENS FROM FIFTY WORKERS IN AN ASBESTOS MILL. *F. W. Simson and A. S. Strachan. Jour. Path. and Bacteriol., Jan., 1931, vol. 34, pp. 1–4.*

The result is reported of examining sputum from fifty workers who were intensively exposed to asbestos dust in a mill in South Africa. Asbestosis bodies were easily demonstrated by direct thick films. They were found best by examining specimens taken early in the morning; in the evening the mouth and nasal pharynx were too loaded with dust for the bodies to be easily detected. The sputum was always mucoid in character, often resembling egg albumin. No tubercle bacilli were found. The asbestosis bodies were intracellular, and their study suggested that they were formed by the deposition on asbestos fibers of iron containing substance elaborated by the cell. The shortest exposure to be followed by the appearance of the bodies was five months.—E. L. C.

FURTHER OBSERVATIONS ON PULMONARY ASBESTOSIS, WITH SPECIAL REFERENCE TO ASBESTOS DUST AND THE CURIOUS BODIES FOUND IN THE LUNGS. *W. E. Cooke and C. F. Hill. Abstr. as follows from Jour. Roy. Micr. Soc., 1930, vol. 50, p. 15, in Physiol. Abstr., Feb., 1931, vol. 15, p. 626.*

In a case of suspected pulmonary asbestosis sections of the lung or macerations of the tissue revealed a large amount of fine granular black dust, but the fine spicules of fiber which make up the bulk of asbestos dust were not found. There were present, however, large fragments (5 to 360 microns) closely resembling in size, shape, and color various constituents of asbestos dust. These large fragments are found in the lung embedded in fibrotic or necrotic areas of which they are the cause. In addition, curious bodies were present which are believed to be diagnostic of pulmonary asbestosis. These bodies were eventually shown to consist of a central core of asbestos fiber enclosed in adsorbed débris.—C. K. D.

ANTHRACOSIS, SILICOSIS, AND TUBERCULOSIS IN COAL-MINERS. *S. L. Cummins. Lancet, Jan. 31, 1931, vol. 1, pp. 235–238.*

The claim is made that anthracosis is a dual condition, in which coal dust

is retained in the lungs owing to a state of fibrosis with lymph blockage. The pathologic condition arising from dust inhaled together with the coal and also chemical analyses are similar, so far as the content of silica, to those found in cases of pure silicosis. In certain cases of "hard heading" work, where rocks rather than coal are mainly tackled by the miners, silicosis develops which is indistinguishable from that seen in other cases of silica risk. But when coal has been the chief dust inhaled, no tendency to succumb from tuberculosis is found; and the suggestion has been offered that coal dust exerts a protective influence against tuberculosis. This idea is, however, not definitely accepted; at least, the suggestions to explain why the coal miner has a low mortality from tuberculosis, although his lungs show definite fibrosis, are not accepted. Professor Cummins now puts forward the possibility that carbon particles in the lungs adsorb the active principle of tuberculin. He points out that such adsorption occurs *in vitro*, since he has found that finely powdered dust of anthracite coal is capable of adsorbing a large proportion of the active principle from old tuberculin diluted with normal saline solution. Whether or not carbon dust particles bathed in the tissue juices retain this adsorbing power requires further investigation. Some clinical facts appear to favor the theory. Certainly, negative sputums are more common in clinically tuberculous coal miners than in other clinically tuberculous adult males. Although any excessive liability to tuberculosis is absent in the case of coal miners, a high mortality from bronchitis among old colliers is present, which, in all probability, is closely associated with the life of exposure, not only to coal dust but to stone dust as well.—E. L. C.

OBSERVATIONS ON THE DIFFERENTIAL DIAGNOSIS OF SILICOSIS BY MEANS OF THE ROENTGENOGRAM AND AN INVESTIGATION INTO THE RISKS OF SAND BLASTERS. *Lochtkemper. Abstr. from Arch. f. Gewerbepath. u. Gewerbehyg., 1930, vol. 1, pp. 271–302, in Ber. ü. d. ges. Physiol. u. exper. Pharmakol., Oct. 8, 1930, vol. 56, p. 182.*

The author distinguishes roentgenologically the various forms of silicosis, pneumonokoniosis caused by quartz dust. The first stage is characterized by enlarged hilum glands and by increased vascular markings; the second stage, by numerous infiltrated and isolated nodules and increased induration; the third stage, by the so-called "snowstorm" effect, which is partly an isolated and partly a confluent mottling.

The rate of dust inhalation and the concentration of the quartz content are important in the resulting roentgen picture. Among workers in industries whose dust contains free silicic acid—sandstone grinders, stonecutters, sand blasters, porcelain workers, and stone hewers—there are found in the X-ray picture of the lung, near the enlarged hilum, small, sharply defined shadows from pinhead to pea in size, some of which are isolated and others joined by fine streaks. The thickness of the nodules is greater in sandstone grinders and stonecutters than in porcelain workers and stone hewers, and in occupations in which a mixture of quartz and clay dust is inhaled. In the further development there is a gradual increase in the small shadows with an

incipient conglomeration to form larger connected shadows and a gradual coalescing, phenomena which are associated with stonecutters, wet sandstone grinders, and sand blasters. The circumscribed shadows appear less clearly in the lungs of stone hewers. Weak, diffuse, and cloudy shadows are characteristic of the coal dust lung; silicotic shadows are, however, for the most part, also evident. The X-ray picture of the schamotte stoneworkers shows less nodule formation, and a somewhat greater expanse of connected shadows.

In the second part of the paper are reported the results of the examination of twenty-five sand blasters, twenty of whom had indications of silicosis in different stages.

THE EFFECT OF PROLONGED EXPOSURE OF THE SILICEOUS SPICULES OF A WATER SPONGE (*Spongilla Fragilis*) TO THE ACTION OF ANIMAL TISSUES: A CONTRIBUTION TO THE PATHOGENESIS OF SILICOSIS IN MAN. *R. G. Mills. Am. Jour. Hyg., Jan., 1931, vol. 13, pp. 224–234.*

The spicules of the fresh-water sponge, *Spongilla fragilis*, are composed of opal, a form of hydrated silica, which is similar to quartz in its chemical reactions. These spicules, when introduced into the tissues of animals, are slowly but definitely dissolved, proving conclusively that silica is soluble in the tissue fluids of animals, and presumably of man. This confirms the assumption held by many students of silicosis that particles of silicious material are gradually converted into the colloidal state and as such exert a fibroplastic influence on the lungs of miners and other exposed industrial workers. Definite fibrosis of the lung of a dog into which the spicules had been introduced suggests that there is a concomitant injury attributable to the disappearance by solution of the silicious elements of the spicules.—*Author's Summary.*

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

OCCUPATIONAL ECZEMA. *M. Oppenheim. Arch. Dermat. and Syph., Feb., 1931, vol. 23, p. 346.*

The dermatitides may be divided into the following groups: (1) In dermatitis, *sensu strictiori,* the skin is able to deal with the irritant; almost everyone's skin reacts to certain strong irritants (*e. g.*, croton oil); even if, with slight variation, the course is acute, healing soon follows the removal of the poison. (2) In toxicoderma there is a congenital or acquired idiosyncrasy. The slightest irritant evokes it. The incubation period is short. The effect is marked and the course acute. (3) In eczema the entire skin is sensitized. For this reason the intensity of the irritant may be slight. The development of dermatitis is gradual. The course is prolonged and healing delayed.

Occupational eczema is among the most frequent of eczemas, the most frequent of skin diseases, and the most frequent of all diseases. The predisposing factors are important: immersion of the hands in water, soap, alkali or acid, and the influence of heat, cold, and mechanical action. Occupational eczema is allergic, but the predisposing factors mentioned play an important part. Dermatitis artificialis acuta re-

sembles occupational eczema. The patch test has only a limited value. Attempts at desensitization have produced only slight results.

DERMATITIS DUE TO SENSITIZATION TO CONTACT SUBSTANCES. DERMATITIS VENENATA, OCCUPATIONAL DERMATITIS. *B. Kesten and E. Laszlo. Arch. Dermat. and Syph., Feb., 1931, vol. 23, pp. 221–237.*

In eighteen of a series of twenty-one patients suffering from dermatitis venenata or occupational dermatitis, the etiology was determined or corroborated by patch tests. In the remaining three there was an exacerbation of the dermatitis when the substances were applied to the sensitized skin. In all of the cases there was freedom from dermatitis when the specific substance was avoided.

The sensitizing substances were: paraphenylenediamine, sodium bichromate, novocaine, novol, potassium mercuric iodide, primrose, poison ivy, pyrethrum, mascara, face powder and face cream. In the dilutions used, none of these substances was found irritating to the normal skin.

Passive transfer of sensitization was unsuccessful.

A case of local sensitization and desensitization to potassium mercuric iodide is reported.

In most instances dermatitis venenata and occupational dermatitis result from local cellular sensitization to specific non-proteins acquired by previous contact of the substances with the skin.—*Authors' Summary.*

A CASE OF EPITHELIOMA DEVELOPING RAPIDLY AFTER AN INJURY BY BURNING ASPHALT. *A. Gunsett. Abstr. as follows from Bull. Assn. franç. pour l'étude du cancer, 1930, vol. 19, p. 459, in Am. Jour. Cancer, Jan., 1931, vol. 15, p. 357.*

A workman aged 50 years was burned on the back of his hand by a small piece of burning asphalt. The wound did not heal, and three months later there was a nodule at the site of the injury 1 cm. in diameter. The mass was excised and found to be squamous-cell epithelioma with large keratotic pearls, a few mitoses, and a moderate inflammation of the stroma. Pain in the wound rendered it necessary to remove the sutures, and some small nodules on the border of the scar were submitted to microscopic examination and found to contain some remnants of the growth. After this second operation, the lesion was treated with radium, and healing occurred. The case is too recent to know whether further metastases will take place.

Four similar cases from the literature are referred to. In three, burns were followed by rapid development of cancer; in the fourth, however, the tumor, in this case on the lip, did not appear for two years after the burn, and hence cannot be absolutely correlated with the injury. (Two similar instances of the development of an epithelioma following burning of the skin with sulphuric acid are also on record.)

WARTS FROM MINERAL SUBSTANCES. *A. P. Dewirtz. Abstr. from Roussky Vestnick Derm., March, 1930, pp. 243–247, in Ann. de dermat. et syph., Dec. 30, 1930.*

This writer, when examining workers among asbestos, found a kind of

dermatosis. It is chiefly confined to the palmar surfaces of the hands and fingers; in young people who go about without shoes, it occurs also on the soles of the feet. The right hand is usually more extensively involved than the left. The individual lesions consist of apparently noninflammatory, round or polygonal, rough-topped warts. They vary in size from a millet seed to a pea. Sharp needles of asbestos enter the skin, and thus produce these papillomas. The thin skin of youth and the flexures of the joints are particularly vulnerable, and on these parts the warts are chiefly found. They are most objectionable because of the pain and discomfort they cause when walking, and because of the trouble and inconvenience they give to those who handle tools. These little tumors are well known to the operatives, and are called *verrues d'amiante*, or asbestos warts. The irritation they produce leads the employees to remove the fine spicules of mineral which stick into the skin, either with a pin or a needle, or with the nails. This gives only partial relief, as the little tumors continue to grow or recur on the same place.

The histologic picture was examined and described by Dewirtz. The horny and malpighian strata are largely increased. In the dermis are a large number of round and polymorphic cells, situated especially in the papillary layer. In these warty growths Dewirtz has found the crystals of asbestos. These he accuses of being the cause of the thickening of the rete mucosum and the basal layers, and of the formation of giant cells. The whole condition turns out to be a very slow chronic local inflammation. The author says that this is the first occasion on which these asbestos warts have been brought to the notice of the dermatologist. He suggests that surgical removal is the only advisable course to pursue.—R. P. W.

ERUPTION CAUSED BY RESINS OF TREES. *Longin. Abstr. as follows from Bull. Soc. franç. de dermat. et syph., July, 1930, vol. 37, p. 741, in Arch. Dermat. and Syph., Feb., 1931, vol. 23, p. 333.*

Three cases of eczematiform eruptions produced by volatile constituents escaping from freshly hewn wood are reported. In one case there was an exacerbation when an intradermal injection of an extract of the suspected wood was administered.

OCULAR HYGIENE IN INDUSTRY. *V. de Uzeda. Abstr. as follows from Folha med., 1930, vol. 11, pp. 290–292, in Bull. Hyg., Jan., 1931, vol. 6, pp. 20–21.*

This is a brief sketch of the conditions of interest to the ophthalmologist as they are met with in industry. Reference is made to the risks of working in defective light, in excessive artificial light, and the aggravation which may arise in morbid conditions already existing, *e.g.*, myopia. Secondly, there is a discussion on the irritant effects of certain gases, especially in chemical factories, of dust or larger particles in those working with metal or stone, intoxications as from mercury, phosphorus, nitrobenzene, arsenic, etc.; the effect of heat, as cataract in those attending to furnaces, in glassworkers and others; and finally trauma from fragments of wood, metal, glass or stone, causing various degrees of damage from slight conjunctivitis to

actual penetration of the anterior chamber and its complications and sequelae.—H. H. S.

THE FIELDS OF VISION IN MINERS' NYSTAGMUS. *C. F. Haycraft. Abstr. as follows from Brit. Jour. Ophth., Oct., 1930, vol. 14, p. 523, in Arch. Ophth., Jan., 1931, vol. 5, p. 146.*

From the study of the fields of vision in a series of forty-three cases of miners' nystagmus, of which thirty-five were old and eight were new cases (that is, certified as suffering from the disease within the previous six months), the author arrives at the following conclusions:

In a large percentage of cases of miners' nystagmus there is a definite alteration in the fields of vision. The most common change is a concentric contraction for white. A large number of patients show contraction for red and blue, and interlacing of these colors is frequent. The amount of contraction of the fields is usually but not invariably a measure of the severity of the disease. In the absence of physical signs, the change in the fields described, combined with typical subjective symptoms, can be relied on in diagnosing miners' nystagmus or in determining that recovery is still insufficient to permit work underground.

INDUSTRIAL SURGERY

SHOULD LAYMEN GIVE INJECTIONS OF LOBELIN AND CARDIAZOL? *L. Teleky. Med. Welt, 1929, no. 2.*

A large number of doctors consider injections of lobelin of extraordinary value in restoring life in cases of apparent death, and Teleky here suggests that as doctors are bound to take time arriving on the scene of the emergency, laymen should be trained to give injections as part of first aid teaching. It is generally objected that it would be dangerous for laymen to give injections, but in giving first aid in industry they often undertake methods which may involve greater risks. Thus in the Silvester and other methods of artificial respiration, broken ribs and injury to the liver have occurred, while the tongue may be injured by drawing it forward and fixing it. In cases of trismus, opening the jaws may cause wounds of the lips and broken teeth. The use of the pulmotor, which is recommended in factories, requires training and skilful manipulation. The bandaging of a broken limb may be the cause of great injury. Compared with these risks, those from giving injections are small.

Thirty years ago, it was quite common in clinics to give injections without any aseptic or antiseptic precautions, and at the present day many morphinists give injections through their clothing without any serious results. Lobelin is kept in ampoules in emergency aid boxes, and it would not be difficult to teach the giving of injections as part of a first aid course. It has been found in cases of gas poisoning in Düsseldorf that firemen trained in first aid arrive on the scene a half to a quarter of an hour before the doctor, and as every minute is so important, it would be a great advantage if these men were able to give injections of lobelin and even of camphor or cardiazol if necessary.—A. J. C.

RELATION OF TRAUMATIC SURGERY TO INDUSTRY. *J. W. Martin. New Jersey Med. Soc. Jour., Jan., 1931, vol. 28, p. 6.*

HEALING OF WOUNDS UNDER ADHESIVE PLASTER BANDAGE. *E. Dabasi. Abstr. as follows from Arch. f. klin. Chir., Aug. 26, 1930, vol. 161, p. 117, in Jour. Am. Med. Assn., Nov. 15, 1930, vol. 95, p. 1543.*

Experience has convinced Dabasi that both the number and the virulence of bacteria are lessened under an adhesive plaster bandage. In the course of the treatment the underlying tissues reach a state of alkalosis in most cases. In 100 cases treated in this wise there was not a single complication nor a spread of the infection. Wound healing progressed very favorably. In fact, the author stresses the importance of moisture in favoring wound healing and points out that even pus is of value in that respect, provided it does not contain harmful elements, especially bacteria. Here the adhesive plaster bandage is of value because of its effect on the bacteria and without hindering wound secretion, which is needed to promote healing. Furthermore, it is cheap, is applied easily, is taken off easily, and never causes the patient any pain. It should be changed every ten or twelve days, at the latest; he prefers to do this every four or five days. The duration of the treatment varied from fourteen to thirty days, instead of months or even years, and the scar is less disfiguring than with the treatment usually employed. The method should not be used in cases of progressing suppurations; that is, when there is an evident tendency to spread, which calls for more radical measures.—C. K. D.

TREATMENT OF SUPPURATIONS OF FINGERS AND HAND. *S. Sokolov. Abstr. as follows from Arch. f. klin. Chir., Aug. 26, 1930, vol. 161, p. 89, in Jour. Am. Med. Assn., Nov. 15, 1930, vol. 95, pp. 1542–1543.*

Sokolov advises early operation in all these cases, under light general anesthesia in an absolutely bloodless field. The tourniquet should be applied to the upper arm. He never uses sharp hooks, nor does he resort to exarticulation. In cases of suppurative tenovaginitis, early intervention and subsequent immobilization (rest) of the extremity are of vital importance to complete recovery of function. Bandages and dressings must be applied with extreme care so as not to cause pain, and active motion is essential to the prevention of adhesions.—C. K. D.

BURNS: PREVENTION OF PAIN AND TREATMENT. *M. Novak. Abstr. as follows from München. med. Wchnschr., Sept. 26, 1930, vol. 77, p. 1669, in Jour. Am. Med. Assn., Dec. 6, 1930, vol. 95, p. 1788.*

Novak contradicts the theory advanced by the Sauerbruch clinic that solutions of procaine hydrochloride-epinephrine create unnatural conditions in the tissues and thus lower the resistance against infections. This is the case only if, as solvent for the procaine hydrochloride, either a neutral or a weakly acid physiologic solution of sodium chloride is employed, because such a solution would not be iso-alkaline with the blood. But if a solution is used that has the alkalinity

of the blood the results are favorable. This has been corroborated by several investigators. The author advises that burns be treated by applying immediately sterile cotton compresses that have been saturated with the solutions designated. After from ten to twenty minutes, the compresses are changed. If the burns are deep, the compresses should be applied for about three hours. When this treatment is employed the pain ceases almost instantly, minor blisters disappear after a short time, and the skin becomes again attached to the tissue. The further treatment is done by dusting the wound with iodoform. Wounds that are kept aseptic heal without scars in from eight to ten days. The author considers as the main advantage of this treatment the fact that the pain ceases almost instantly, and this relief of the injured person effects an increase in the resistance and thus promotes the healing process.—K. R. D.

WHIRPOOL BATHS AND POSTERIOR SPLINTING TO OVERCOME CONTRACTURES IN BURNS. *J. W. Hilbert. Jour. Am. Med. Assn., Oct. 4, 1930, vol. 95, p. 1021.*

The author reports a case in which this unique treatment was carried out and gave excellent results:

July 8, 1930, a white man, aged 24, sustained extensive second and third degree burns to both extremities from the ankles to the middle third of the thighs. The whole circumference of both limbs was involved. A thick application of ointment dressing was applied and the patient removed to the hospital. Within twenty-four hours the patient presented a toxic picture with chills, fever, and rapid pulse; he became delirious; the urine showed albumin, much pus, granular casts, and blood. The routine procedure of relieving the kidneys was followed with normal response, but by the fifth day sloughing of the burned areas and purulent secretions became very extensive. Because of the pain associated with the dressing and cleaning of the parts, the patient's extremities were subjected to whirlpool baths, at a temperature beginning at 100°F. and increasing to 110°, for ten minutes. This not only took away all secretions and the major portion of the sloughs but also affected a stimulating massage. On the seventh day the first evidences of contractures became manifest and within twenty-four hours there was right angle flexion of the limbs at the knees. Two light weight but strong veneered boards were designed so as to extend from the patient's heels to just below his buttocks. These were tapered from 2½ inches at the distal end to 8 inches at the proximal extremity. After padding with cotton and covering with gauze the splints were placed, one posterior to each limb, and 2-inch gauze ties were used as an anchorage at the ankle and at the middle third of the thigh. By this method the weight of the limb, after twenty-four hours, overcame without pain to the patient almost all of the contracture at the knees, so that the 8-inch distance from the splint to the popliteal space on application of the splint was reduced to 3 inches in one day's time. In another twelve hours the legs were fully extended and the splints were removed. After three days there again appeared some flexion, but this was readily overcome by reapplication of the splints for a period of another twenty-four hours. Whirlpool baths followed by water cooled ultraviolet irradiations were continued daily to July 24, at which time this procedure was done every second day until August 8. After six weeks' time the patient has but a few denuded areas on each leg, which are rapidly filling in with healthy epithelium. He walks normally, without pain; he can flex and extend both limbs normally and will have no permanent impairment.

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

PROPHYLAXIS OF DIVERS' DISEASE. *Blattner and Zangger. Abstr. as follows from Schweiz. med. Wchnschr., Nov. 22, 1930, vol. 60, p. 1104, in Jour. Am. Med. Assn., Feb. 14, 1931, vol. 96, p. 564.*

Blattner and Zangger point out that the waterworks that some cities in Switzerland have at deep lakes sometimes make it necessary for divers to work at a depth of about 40 meters. In rendering expert opinion on the death of a diver, the authors stress that the diver had risen to the surface rapidly and that the extreme difference in pressure had caused the hemorrhages and death. In order to avoid such occurrences, the divers should be given instructions, so that they will understand and adhere to the rules that are given for their safety. The authors think that, in order to avoid similar fatalities as the one described, a high pressure apparatus should be kept in readiness wherever divers have to work at depths of more than 12 meters, so that if the diver is forced to come up rapidly the apparatus will be there to help in the adjustment of the pressure and thus prevent hemorrhages and death.—K. R. D.

FATAL ACCIDENTS FROM ELECTRICITY. *F. Pietrusky. Abstr. from Med. Klin., 1930, vol. 26, pp. 339–341, in Bull. Hyg., Jan., 1931, vol. 6, pp. 27–28.*

The author considers that many of the deaths which occur from electricity could be prevented by a better knowledge of suitable methods of treatment. Recently he was called on to examine the body of a boy who had received a shock two days before from a 220-volt current, and found froth over the mouth and nose. As the weather was cold he thought there was no doubt that this froth had been caused by breathing and that death had been only apparent at first, and that the doctor who was called should have tried means of resuscitation instead of at once pronouncing life extinct.

There is a widespread opinion that only the high tension currents are dangerous, and in consequence warning notices are put on them and none on the low currents of 120 to 220 volts usually used for lighting. A man connected the light current to the handle of a door, and another who endeavored to enter fell dead. The defence in court was that the light current was not dangerous and an acquittal resulted. A mason who held a bare electric light wire with a current of 120 volts with one hand while the other rested on a newly built wall was killed; but a 14-year old boy who climbed up a fence and grasped an iron mast carrying 45,000 volts was not killed, although severely burned.

The author has made a number of experiments on guinea-pigs and has found that an exposure of fifteen seconds to currents varying from 2,000 to 20,000 volts caused unconsciousness at once and that there was complete recovery after about a minute. With 30,000 volts the animal recovered consciousness but died five minutes later. Deaths from high tension current cannot be regarded as entirely due to electricity; in many cases burning is the chief cause. Further experiments

with guinea-pigs with 200 to 1,000 volts alternating current caused death after fifteen seconds' contact. In ten fatal cases among men which have come to the author's notice, in which a current of from 120 to 220 volts was the cause, the persons affected stood on damp floors. The effect of an alternating current is more severe than that of a continuous one, and the smaller the number of phases the greater the effect. The resistance of the skin has been found to be between 1,000 and 1,000,000 ohms, and the degree of its moisture and its impregnation with metallic oxides are important features. Schridde has found that in nine-tenths of all fatal cases the current entered at the left hand, and believes that the heart is specially affected in such cases. The same observer has found by postmortem examination a "thymo-lymphatic condition" in thirty-six cases out of thirty-seven.

No accident from electricity should be regarded as fatal till prolonged treatment has been tried. The usual period of treatment of two to three hours is too short; it should be prolonged till definite secondary signs of death, such as postmortem lividity, appear.—A. J. C.

CLIMATE

AIR POLLUTION FROM THE ENGINEER'S STANDPOINT. *H. B. Meller. Heating, Piping and Air Conditioning, Jour. Sec. of Am. Soc. Heating and Ventil. Eng., Jan., 1931, pp. 70–75.*

The author discusses the problem under the following headings: Origin and Composition of Smoke; Effects of Smoke; Psychological Aspects of the Smoke Problem; Hygienic Aspects; The Responsibility of the Engineer; and What Must Be Done.

No references or tabulated data are included, nor does the article contain information of the caliber one would be justified in expecting from the author or from the Mellon Institute.—P. D.

INDUSTRIAL SERVICE AND MUTUAL BENEFIT ASSOCIATIONS

MINERS' WELFARE FUND. NINTH ANNUAL REPORT. *H. M. Stationery Office, 1930, pp. 68.*

This annual report tells of further activities financed from the Miners' Welfare Fund, raised by a levy of 1 penny per ton of coal obtained from British mines, and also for the construction of pithead baths by a levy on royalties. The total credits of the Fund, since its inception ten years ago, have now reached £10,500,000; but the pithead bath levy has existed only since 1926. Reference is made to further schemes of recreation, which, for the most part, follow on well-accepted lines. Here, however, a warning note is raised as to the need for community leaders to keep enthusiasm, which is always present at the start, so sustained as to insure a useful life for the schemes.

Progress in the development of convalescent homes, of which there are now a large number established for miners, was considerable; but they are by no means all conducted with equal economy, since they show variations

in cost from 23s.9d. per patient per week, grading up to 59s.8d. Aid has, in many cases, been given to local hospitals, and in one instance an allocation of £3,500 was to assist in the purchase of radium. Grants for educational purposes were distinctly higher during the year. Reference is made to the activities of the Safety in Mines Research Board, which are nearly wholly financed by the Fund. Excellent work has been done, and the Committee has decided to raise the annual income of the Board in the future to a figure of £60,000, which should remove anxiety in regard to desired developments.

The section dealing with the construction of pithead baths is perhaps of most interest. The total number of schemes financed up to the end of 1930 was eighty-four, of which thirty-four were dealt with during the year. When completed, these eighty-four schemes will accommodate 109,000 miners, representing an increase of 48,800 during the year. The plan of providing each man with two lockers, one for his pit clothes and one for his day clothes, is now always adopted; and the type of most of the appliances has become fixed. By this means, purchases can be made economically on a large scale, which helps to reduce the average cost of the baths. It is too early yet for useful figures as to costs of running to be ascertained. A new point appears to be a method of ventilating the lockers by a plenum system of hot air, which promises to be not only more effective in drying the clothes, but also more economical in action.

The report contains many excellent illustrations of the institutes, recreation grounds and convalescent homes financed by the Fund, which undoubtedly represents the largest effort in the world at organized industrial welfare. —E. L. C.

J. I. H.
May, 1931

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

MERCURY POISONING; ITS CLINICAL DIFFICULTIES AND ITS PATHOGENESIS. REPORT OF TWO CASES OF BROWN SUBLIMATE KIDNEY. *P. F. Shapiro. Jour. Lab. and Clin. Med., July, 1930, vol. 15, pp. 961–972.*

Two cases of fatal mercury poisoning are described, which clinically were obscure. Lack of history was the chief diagnostic handicap. It led readily to incorrect interpretation of clinical symptomatology which in retrospect was typical for an acute and for a subacute poisoning. So remote was the suspicion of mercury that chemical examination was not even tried.

Histologic examination retrieved the diagnosis in both cases. It demonstrated the extreme activity and rapidity of regenerative changes in mercury nephrosis. This lively regeneration is more specific for mercurialism than is calcification which indeed was slight or absent in both cases. The pathogenesis of mercury nephrosis is reviewed. Attention is called to the fact that when calcification fails to appear, inflammatory reaction in the kidneys is likewise absent. There are then no interstitial infiltration and insufficient hyperemia to produce the typical red sublimate kidney of the third stage. Both cases described lacked this inflammatory reaction, and are presented as examples of the less frequent brown sublimate kidney. —*Author's Conclusions.*

OBSERVATIONS AND NOTES ON THE EFFECT OF METHANOL ANTIFREEZE ON HEALTH. *R. R. Sayers and W. P. Yant. U. S. Bur. Mines, Information Circ. No. 6415, Dec., 1930, pp. 5 (multigraphed).*

As a result of the recent increase in the use of methanol as an antifreeze for automobile radiators, an investigation was undertaken by the Bureau of Mines, under a co-operative agreement with the Carbide and Carbon Chemicals Corporation, DuPont Ammonia Company, and the Commercial Solvents Corporation, for the purpose of determining the hazard involved in the manufacture and marketing of this product. A brief statement is here given of the findings to date. Conclusions and recommendations based on these observations are as follows:

1. Observations made by the Bureau of Mines have indicated that there is no danger of poisoning from the reasonable use of methanol as an antifreeze for automobile radiators.

2. The evidence that methanol poisoning has been caused by absorption through the skin is rare and inconclusive.

3. Practically continuous exposure to low concentrations and short intermittent exposure to high concentrations of methanol cause no apparent harm; but, on the other hand, continued exposure to high concentrations will cause serious poisoning.

4. All methanol, whether made by wood distillation methods or synthetic methods, or whether it is crude, refined, or highly purified, is poisonous when taken internally. It will cause serious poisoning, blindness, and possibly death when as little as 2 ounces is taken into the stomach.

5. To avoid misuse it is recommended that in the future all antifreeze methanol be brightly colored to enable garage attendants and the public to identify it as methanol; and to warn against misuse, particularly for beverage purposes.

6. The largest producers of methanol antifreeze label their containers so as to call attention to the hazards of misuse of methanol and also issue information and instructions to garage attendants and the consuming public warning against its misuse. It is recommended that these precautionary measures be adopted by all producers.

—M. C. S.

NICOTINE POISONING BY ABSORPTION THROUGH THE SKIN. *D. J. B. Wilson. Brit. Med. Jour., Oct. 11, 1930, vol. 2, pp. 601–602.*

Two cases are reported of nicotine poisoning by absorption through the skin in gardeners who had been applying a winter-wash insecticide to trees in a peach house. The solution was well worked into trunks and branches, using a motor car spoke brush; to reach inaccessible parts and small twigs against the wall, the brush was dispensed with and the bare fingers were used. Neither man had regarded the caution that "when spraying or dipping for a length of time, rubber gloves should be worn."—M. C. S.

TAR CANCER IN BADEN. *Brenner. Abstr. as follows from Ztschr. f. Krebsforsch., 1930, vol. 31, p. 479, in Am. Jour. Cancer, Jan., 1931, vol. 15, p. 368.*

Brenner discusses the technical details of tar manufacture, the different types of tar, and the means which should be used to protect the workingman from the bad effects of tar. He points out that in the gas works of Baden no cases of cancer have been found among the workers in contact with tar, nor even skin eruptions, but in certain of the tar distilleries workmen have been found to have tar cancer and tar warts.

This difference between the gas

factories and the tar distilleries may be due to the fact that the gas worker does not come in direct contact with the tar, and possibly, also, that the precautions against contact with tar are more complete in the gas works system. There is evidence that they are not so complete in the tar distilleries. The cure of the situation is obvious. An excellent bibliography is appended.

TAR CANCER. *R. Calvanico. Abstr. as follows from Morgagni, 1930, vol. 72, p. 831, in Am. Jour. Cancer, Jan., 1931, vol. 15, p. 313.*

Calvanico treated 500 white rats with tar, painting it on the skin and administering it orally, subcutaneously, and intraperitoneally. In some cases tar distilled above 400° was used; in others whole tar. Guinea-pigs and dogs were also painted with tar. The treatments were repeated over a period of a year. The longer the treatment, the more marked were the gross and histologic changes. Finally, ulcers with indurated edges resulted. There were no metastases. On section the ulcerated areas showed superficial necrosis, at the base of which strands of epithelial cells infiltrated the derma irregularly. There was dense lymphocytic infiltration of the derma.

The author believes these changes to be fundamentally inflammatory rather than neoplastic. He feels that in most cases tar causes only hyperplastic and degenerative changes; at the most only more or less atypical forms of cellular growth which differ from a true neoplasm in that they remain localized. These findings, in his opinion, support Roncali's concept that in animals tar merely modifies cells so as to render them susceptible to the truly neoformative agents, which are special parasites and their toxins.

ARTIFICIAL PREDISPOSITION TO TAR CANCER. *S. Choldin. Abstr. as follows from Ztschr. f. Krebsforsch., 1930, vol. 31, p. 545, in Am. Jour. Cancer, Jan., 1931, vol. 15, pp. 313–314.*

The importance of predisposition, either inherited or acquired, in the development of the tumor process can scarcely be doubted. Choldin's series of facts and clinical observations are convincing. His experiments were conducted on mice, with gas works tar. He combined thermic irritation with simultaneous tarring of the heated area. Hot tar was used, with cold tar as a control. The tumors appeared rather later in the animals treated with hot tar than in the controls, though the growth was more rapid, ulceration appeared sooner, and the animals died more quickly. Four cancers in ten animals were found with the hot tar, and seven in ten animals with the cold tar.

The animals of the second series were treated with a 1 : 5,000 indol solution, or a 1 : 5,000 arsenious acid solution, and then painted. The author thinks that he has shown, on the basis of sixty animals, that the injection of small doses of indol and arsenic creates a certain predisposition to tar cancer. The growths developed rather more rapidly than in the controls.

THE RELATIONSHIP BETWEEN TAR AND THE PRIMARY TUMORS OF THE LUNG IN MICE. *L. Mercier and L. Gosselin. Abstr. as follows from Compt. rend. Soc. de biol., 1930, vol. 104, p. 54,*

in Am. Jour. Cancer, Jan., 1931, vol. 15, p. 316.

The repeated application of tar to the skin or by intraperitoneal injection may cause the appearance of tumors in the lungs of mice. Murphy and Sturm, and more recently Schabad, have always obtained growths of carcinomatous type, whereas Mercier and Gosselin have noticed the formation of lymphadenomas, especially after intraperitoneal injections. In one case the animal showed a carcinoma in addition to the lymphadenoma. The writers point out that this may explain the Schneeberg tumors of the lung which have been considered carcinomas by some pathologists and sarcomas by others.

THE CHANGES IN THE ELASTIC TISSUE IN THE EXPERIMENTAL TAR CANCER OF WHITE MICE. *G. Sedginidse. Abstr. as follows from Ztschr. f. Krebsforsch., 1930, vol. 31, p. 369, in Am. Jour. Cancer, Jan., 1931, vol. 15, p. 316.*

The study of thirty-eight normal mice by Sedginidse showed that the morphologic structures of the skin and subcutaneous tissues can be divided into three constitutional groups —the fatty, the fibromatous, and the intermediary. Elastic tissue is abundant in the fibromatous, scanty in the fatty types. These constitutional changes are constant under experimental pathologic conditions. Seventy-seven animals were painted with tar. In the course of the development of tar cancer in mice, alterations are produced in the elastic tissue system of the skin which resemble changes seen in old animals, but are more marked. These changes are chiefly produced by the toxic action of the tar, and not by the process of tumor formation itself. New formation of elastic tissue cannot be demonstrated in tar cancer.

Morphologic pictures which have been considered by many as protective reaction of the elastic tissue against developing cancerous processes are looked upon by the authors as evidence of a regressive character, representing merely an aging of the elastic tissue system, apparently in consequence of the toxic action of the tar. Unfortunately, the six photomicrographs which illustrate the article are not very good. It is a pity that a careful paper of this type should not be better illustrated.

CHANGES IN THE SUPRARENAL CORTEX IN RABBITS PAINTED WITH TAR. *A. Babes. Abstr. as follows from Bull. Assn. franç. pour l'étude du cancer, 1930, vol. 19, p. 404, in Am. Jour. Cancer, Jan., 1931, vol. 15, p. 316.*

Babes presents a detailed description, with four poor photomicrographs, of changes observed in the adrenal cortex of tarred rabbits.

CARCINOGENIC SUBSTANCES AND THEIR FLUORESCENT SPECTRA. *E. L. Kennaway and I. Hieger. Brit. Med. Jour., 1930, vol. 1, p. 1044.*

FURTHER EXPERIMENTS ON CANCER-PRODUCING SUBSTANCES. *E. L. Kennaway. Biochem. Jour., 1930, vol. 24, p. 497.*

THE SPECTRA OF CANCER-PRODUCING TARS AND OILS AND OF RELATED SUBSTANCES. *I. Hieger. Biochem. Jour., 1930, vol. 24, p. 505.*

Abstracted as follows in Am. Jour. Cancer, Jan., 1931, vol. 15, pp. 317–318.

J. I. H.
June, 1931

Kennaway and Hieger have considered carcinogenic substances and their fluorescence spectra in three articles. In a joint contribution they state that it has been known for many years that cancer may be produced by certain industrial products which have been exposed to high temperatures, such as gas works tar and shale oil. This group of carcinogenic materials has been extended by dry heating a variety of substances; acetylene, isoprene, cholesterol, human skin, muscle and hair, and finally yeast, have yielded carcinogenic tars. An attempt was then made to obtain cancer producing substances at body temperature by reactions which might resemble more closely their occurrence in tissues where cancer develops naturally than do the changes in a red-hot tube at 700° to 900°C.

Schroeter in 1920 described a mixture of high-boiling compounds formed when aluminium chloride acted upon tetrahydronaphthalene (tetralin) at 30° to 40°C. Kennaway found that this material was carcinogenic. Inactive material may be obtained if the aluminium chloride is in too low a concentration or acts for too short a time. The tetrahydronaphthalene is not fluorescent, but the carcinogenic material obtained from it shows a blue-violet fluorescence. If this fluorescent light is photographed through a spectroscope, three bands of wave lengths approximating 4,000, 4,180, and 4,400 Angström units are noted. The bands are sharply defined on the short wave length side and grade into the background toward the long wave length side. Certain related compounds were studied which gave fluorescent spectra resembling those above mentioned, and some of these compounds have yielded papillomas in mice, and one case of carcinoma, though the number of animals treated was small.

Chrysene was shown by Twort to cause cancer in mice, and the fluorescence spectrum of chrysene resembles that mentioned, but the bands are displaced considerably toward the region of shorter wave lengths.

The bands thus described are found in the fluorescence spectra of a variety of products, for instance, gas works tar and special distillates of the same, distillates from pitch, California petroleum, and acetylene, yeast, muscle, cholesterol, and hair tar. The following materials give the same spectrum as the carcinogenic materials, but as yet have not produced cancer: the acid mother liquor from tetroylpropionic acid, undistilled aluminium-chloride-treated tetralin, benzyl oleate, and oleic acid. Two possible explanations of this discrepancy may be suggested: (1) that the spectrum is given both by carcinogenic compounds and by allied compounds which are not carcinogenic; (2) that the fluorescence test is a much more delicate one than is the production of cancer in mice. These same products are fluorescent at dilutions of one to two hundred millions, a concentration which would not be expected to affect the skin of the mouse. An additional exception has been noted, as an epithelioma occurred in thirty mice painted with commercial tetralin. The frequent recurrence in cancer producing agents of the fluorescent spectrum described suggests the possibility of its use for the preliminary examination of materials such as lubricating oils suspected of carcinogenic

effect. The test on mice is, of course, necessary for conclusive proof.

In a second contribution Kennaway calls attention to the fact that the carcinogenic factor in gas works tar is known to be present in the higher boiling fractions. A table is given of the results of testing a series of such compounds. Only one, chrysene, produced a cancer. Further details are given as to results obtained by the reaction of aluminium chloride on tetralin. The summary of the results shows that carcinogenic products have been obtained by the action of aluminium chloride upon acetylene, xylene, naphthalene, bromo-benzene, and tetrahydronaphthalene. Four cancers have been obtained in a series of ten mice painted with a solution of a fairly pure specimen of 1 : 2: 7: 8-dibenzanthracene.

Hieger describes the technic of obtaining the fluorescence spectrum. A light from a quartz mercury vapor lamp was filtered through a Wood ultraviolet glass window. The solutions were examined in very thin corked tubes of nonfluorescent "monax" glass 70 x 6 mm. The tube was clamped directly in front of the window from which the light came. The quartz spectrograph (Hieger, No. E 31 of low dispersion) was placed with its slit about 1 cm. from the fluorescent tube with the axis of the collimator tube making an angle of about 80° with the normal of the incident rays. Medium speed panchromatic plates were used. Correct exposure varied from five seconds to an hour or more. The details of the various compounds tested which have been mentioned above are given, together with reproductions of the spectral photographs.

THALLIUM POISONING. *Lancet, March 14, 1931, vol. 1, p. 610.*

Dr. Vasarhelyi has administered thallium by mouth to rats, dogs, and cats, and reports that when the hair began to fall out, he found hyperkeratosis in the stratum corneum, minute abscesses under this stratum, and vacuolation of the stratum spinosum. The stratum papillare was tumefied, rich in blood, and here and there showed cellular infiltration. In a more advanced stage of the intoxication the sebaceous glands were structurally destroyed, the blood vessels of the corium were highly dilated, and infiltration by pus cells extended also into the deeper layers of the skin. In many places also the hair follicles were invaded by pus cells. In the stage of complete baldness no particular changes were noted in the skin, apart from a remarkable increase of eosinophil cells. Thallium could be demonstrated in the urine, feces, salivary glands, muscles, liver, and skin, but not in the thyroid, adrenal gland, or testis. Dr. Vasarhelyi attributes thallium epilation to purulent inflammation of the skin.

DUST HAZARDS AND THEIR EFFECTS

ON THE METHODS FOR THE EXPERIMENTAL INVESTIGATION OF THE PHYSICAL AND CHEMICAL PROPERTIES OF DUST AND OF ITS ACTION ON THE ORGANISM. DESCRIPTION OF THE DUST CHAMBER AND EXPERIMENTAL TEST AS TO ITS ACTION. *E. A. Wigdortschik and J. R. Petroff. Abstr. from Zen-*

tralbl. f. Gewerbehyg., Nov., 1929, N. S. vol. 6, pp. 341–349; Dec., 1929, pp. 373–377, in Bull. Hyg., Oct., 1930, vol. 5, p. 754.

As the effects of dust inhalation are so important industrially, the staff of the Institute of Hygiene has been led to lay down the conditions which ought to be fulfilled by a dust chamber in which it is proposed to subject animals to experimental inhalation of different kinds of dust. These concern: (1) the construction of the dust chamber itself; (2) the arrangements for the air supply; and (3) the arrangements for controlling the dusting inside the chamber.

As a result of numerous experiments in a chamber constructed by themselves, the authors report having demonstrated the possibility (1) of dealing with different concentrations; (2) of producing uniform distribution of the dust particles; (3) of maintaining a constant dust concentration in the chamber; (4) of regulating the size of the dust particles to be introduced into the chamber; (5) of establishing sufficient exchange of air and proper meteorologic conditions in the dust chamber; (6) of determining the dust concentration in the chamber; (7) of cleansing the dust chamber after use.

Determinations of the dust in the chamber were made both gravimetrically and microscopically. For the latter purpose the Owens dust counter was employed. The references show that a very wide field of literature had been surveyed before completion of their apparatus and methods. Three illustrations are given of the many devices used.—T. M. L.

INDUSTRIAL DUST AND PULMONARY TUBERCULOSIS. PART 2 (CEMENT, TOBACCO, AND CLAY SLATE DUSTS). *K. W. Jötten and T. Kortmann. Schrift. a. d. Gesamtgeb. d. Gewerbehyg., N. S. no. 26, 1929, pp. 125. (Translation of Authors' Conclusion, pp. 114–119.)*

In a series of experiments with three kinds of dusts—cement, tobacco, and clay slate—clay slate dust proved to be the most dangerous. That its properties for lung injury are responsible for promoting experimental pulmonary tuberculosis as well as for experimental pneumonokoniosis, is without question. Especially marked was the tuberculosis promoting action, which was demonstrated in experiments on animals previously immunized with tubercle bacilli and then subjected to the three kinds of dusts in question. Immunity against the reinfection dose was very difficult to establish in animals exposed to inhalation of clay slate dust. The lung injuring property of this dust must depend chiefly on its comparatively high silica content, with only 11 per cent. combined with aluminium oxide, while the remaining 46 per cent. is insoluble and is composed for the most part of quartz and feldspar whose dangerous character is acknowledged. Furthermore, we are not concerned with a pure clay slate dust, but with clay slate dust which is mixed with sandstone dust, the dangerous property of which is well known. Beyer referred to this in his article on rock dusting in mines. Because of the danger of injury to the lung tissues, he advised against the use of sandstone dust in this process.

Clay slate dust clogs the lymphatics

of the lungs and is only slowly removed from the lung tissue along with the injected tubercle bacilli, which multiply and thrive in lung tissue destroyed by dust, producing progressive exudative processes.

These changes which we have observed in the rabbit's lung following inhalation of clay slate dust are somewhat more pronounced than those which Jötten and Arnoldi have seen with the clayey, soft Selb porcelain dust, though less pronounced than the changes observed in dust normal as well as in dust immune rabbits after the inhalation of vitrified silicates in the form of quartz containing Freiberg porcelain dust.

Only slight lung injury was caused by cement dust from the Wicking Portland Cement and Water Lime Works of Lengerich, which has a lower total silica content and only 3 per cent. of insoluble silica. Pneumonokoniotic changes naturally followed the longer periods of dust inhalation in the factory experiments and it is somewhat surprising that the changes were not more extensive. This can perhaps be attributed not only to the low silica content but also to the free solubility of the cement and the comparatively rapid elimination of the dust from the lungs (there was no clogging of the lymph vessels). The tuberculosis promoting action of cement dust was also practically negligible. Although now and then a slight tuberculosis promoting action was observed in the dusted lungs of normal rabbits, not much more was noted in dust immune animals previously treated with tubercle bacilli, even after such a reinfection dose as had led to an extended pulmonary tuberculosis in from six to eight weeks in control, undusted animals not previously immunized. The tuberculosis promoting property of cement dust was of a still lower order than that which Jötten and Arnoldi found for coal dust and soot. They claimed that in this respect these two kinds of dust lay near the neutral zone; this statement is even more correct for cement dust. This may be traced to the chemical composition of the cement which contains less silica (total content about 20 per cent.) but more lime (about 62 per cent.). According to Sleeswijk, the harmlessness of cement dust is due to the presence of this large amount of lime.

These experimental results, together with earlier studies on porcelain dust, lead us to acknowledge the accuracy of the statement that the dangerous character of a dust increases according to its content of free or crystalline silica. Accordingly, next to Freiberg porcelain dust (glazed silica), we would place clay slate dust, then the clayey Selb porcelain dust, and finally cement with its low silica content. These four dusts occupy the same relative positions with regard to their tuberculosis promoting action.

Tobacco dust appeared to be still less harmful than cement dust, but after being inhaled for several months it produced slight disease processes in the lungs of the animals; these did not, however, progress to the extent that they did in animals treated with clay slate dust. This disease process cannot be considered as a severe injury to the lung tissues since the elastic tissue of the lungs is not destroyed. Animal losses as a result of tobacco dust inhalation or of the action of nicotine are only occasional. Neverthe-

less, it can be shown that this dust is not completely harmless to the lung tissues.

With a few exceptions, no extreme tuberculosis promoting action, such as was observed after the inhalation of other kinds of dust, was observed in the present series of experiments. This was especially true of the lungs of the previously immunized rabbits exposed to tobacco dust; they very rarely showed progressive exudative processes, but showed, rather, tubercles intermixed with the connective tissue and encapsuled in it. This mild course of experimental pulmonary tuberculosis is again associated with the relatively rapid elimination of tobacco dust from the lungs. Such blocking of the lymph flow in the lungs as one finds in silicosis is not present in lungs dusted with tobacco.

If our experimental results with cement dust are compared with those of other animal experimenters, good agreement is found with the results of Tucker and Schott who considered this as one of the mild dusts, and with the results of Lubenau who considered it as one of the less harmful dusts. These three workers were not concerned with the tuberculosis promoting action. Cesa Bianchi, however, considered this phase of the question, but under inadequate experimental conditions and with too few experimental animals. Moreover, he was not familiar with the pre-immunizing method, and he used guinea-pigs, which are not suitable experimental animals for this work. It is not surprising, therefore, that our results are not in agreement with his.

As far as we can determine, Lubenau is the only one besides ourselves who has undertaken experiments with tobacco dust, and he concluded that it belongs to the type of dusts that are injurious to the lungs. This experimental result should not be taken too seriously, however, since Lubenau's studies dealt only with an acute and intensive dusting, which does not, as a rule, occur in practical experience. With such large doses of dust, Jötten and Arnoldi also were able to bring about acute injury.

Our results with clay slate dust, on the other hand, are in agreement with those of Lubenau; they are at variance, however, with those of Mavrogordato and Carleton, whose experience led them to consider this as one of the mild types of dust. We question whether this holds for all kinds of clay slate dust, the silica content of which varies considerably; in our research, for example, we used a clay slate dust which had a high content of insoluble silica, or quartz, as a result of being mixed with sandstone (high iron and low aluminium oxide content). The variation in results might thus be traced to the difference in silica content.

With regard to the danger from clay slate dust, reference should be made to slate quarriers, slate pencil makers, and roofing slate workers, for whom the tuberculosis mortality rate has increased except in the case of those who are free from dust hazard as a result either of working in the open or of working in modern plants. Poor economic and living conditions often promote tuberculosis and may also be factors here. Exposure to clay slate dust must be considered also in the case of workers who have to do with rock dusting, and especially

those who are employed in the mills where the dust is prepared. Since our practical experience goes back only a short time, as is true also of Schultze's work, there is nothing positive to be said concerning the action of this kind of dust on the lungs of men engaged in this type of work. Dust with a high quartz content or clay slate dust mixed with a high content of silica should, however, be eliminated as far as possible. Further research is necessary in order to show how pure clay slate dust behaves experimentally and, especially, to determine the degree of hazard with varying silica content.

Our next study will be devoted to the dust problems involved in rock dusting. If clay slate dust should actually prove to be injurious to the lungs, there are available several other kinds of dust which are less harmful and which satisfy the requirements of mining authorities. We may mention, for example, limestone dust which contains only about 3 per cent. of silica and has a high lime content. Moreover, official tests have shown that it meets all the requirements of the industry. Our animal experiments with it have been completely satisfactory. An exhaustive report concerning this subject will appear in our next publication.

The relatively slight injury caused by cement dust in our experiments is in complete agreement with previous practical experiences and statistical studies. Only a few authors have ascribed a tuberculosis promoting action to this dust, and their views are no longer significant since statistical studies have nowhere established a high tuberculosis mortality with certainty. The fact that mild degrees of lung injury (Schott, Sommerfeld, and Kästle) are found among workers exposed for a number of years, and that other health derangements occur as a result of severe exposure in industry, together with the results of our experiments, show that cement dust is not entirely harmless. Care must be taken, therefore, to avoid the development of too large a quantity of dust in manufacturing and to insure efficient removal of the dust by suction.

At first glance our experimental results with tobacco dust appear to be at variance with previous experimental results as well as with the statistics on the incidence of tuberculosis in tobacco trades. That tuberculosis occurs frequently among tobacco workers cannot be denied, but the opinion at the present time is that this is not due entirely to employment in dusty work but is brought on by other causes of a social and economic nature. We cannot convince ourselves, however, that tobacco dust is entirely harmless. We therefore stress the importance of improving hygienic conditions, especially of women workers, of furthering vocational selection, of prohibiting employment of young persons, and particularly of installing efficient dust removal systems, and of eliminating the possibility of infection. These observations on tobacco dust inhalation clearly show that other factors are responsible for the dust injuries and particularly for the tuberculosis. They demonstrate the correctness of K. B. Lehmann, the Nestor of industrial hygiene, in his assertion that poor nutrition, bad living conditions, weak constitution, and susceptibility

to infection play a more important rôle in the production of tuberculosis than do moderate dust concentrations.

We hope that we have shown by these observations that it is possible by means of animal experimentation, especially with tuberculosis immune animals, to evaluate the danger of different occupational dusts by extensive parallel studies and to reach conclusions which are in agreement with statistical and practical results. Ickert confirms our opinion by a comparison of the findings of Jötten and Arnoldi with recent and old statistics. The statistics show a scale of dust risk which Ickert states agrees exactly with the experimental findings of Jötten and Arnoldi.

Further studies on the relation of occupational dust and pulmonary tuberculosis will be of value, especially if they are extended over a long period of time and include observations on chronic dust inhalation. The correct evaluation of such animal studies can result only from extensive series of comparable experiments with various kinds of dust; furthermore, statistical and other research findings, as well as the social and economic conditions of the various groups of workers, must be taken into consideration. If studies are carried on this way, it is our opinion that it will be possible eventually to reach a definite decision in regard to the industrial dust problem. —M. F.

ASBESTOSIS BODIES IN SPUTUM AND LUNG. *K. M. Lynch and W. A. Smith. Abstr. as follows from Jour. Am. Med. Assn., Aug. 30, 1930, vol. 95, pp. 659–661, in Arch. Path., Feb., 1931, vol. 11, pp. 291–292.*

In microscopic sections of lung from the body of a worker in an asbestos factory, who died from a gunshot wound, numerous asbestosis bodies were found in the alveoli, the walls of the alveoli, the deeper pleural tissues, the bronchi, and the interlobular framework, in thrombi in the veins and in the peribronchial lymph glands. Associated with them were black granular pigment, in the lymph glands a yellow-brown granular substance, a reaction of mononuclear and polymorphonuclear giant cell phagocytes, and in the framework structures a cellular increase in fibrous tissue. The asbestosis bodies were seen in the sputum of three people who had been workers in an asbestos factory, one as long before as six years. In the sputum, these bodies had a central filament of a transparent, slightly greenish-tinged, needle-like crystal. On this were deposited nodules, blebs, and segments of a homogeneous refractive substance. These bodies were from 12 to 140 microns long and from 1 to 12 microns thick. They did not take the ordinary dyes for tissue and sputum. They could be stained by the Prussian blue reaction for iron. It is suggested that the iron content of the deposit was of tissue origin, probably from the blood.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

MEDICAL TREATMENT OF ANTHRAX. *C. G. Brentnall. Abstr. as follows from Lancet, Nov. 29, 1930, vol. 2, p. 1174, in Arch. Dermat. and Syph., April, 1931, vol. 23, p. 744.*

Brentnall compares the combined surgical and serum treatment of cutaneous anthrax, and of medical treatment alone, and shows that recovery is quicker by the latter method. This comparison is made from cases that occurred in the same district, under much the same conditions of infection as regards site and severity. The treatment consisted in the injection of antianthrax serum and neoarsphenamine and other arsenical preparations.

TUBERCULOSIS IN COAL MINERS. *E. Arnould. Rev. belge de la tuberc., Sept.-Oct., 1929, vol. 20, p. 193.*

This article is abstracted at some length in the *American Review of Tuberculosis* for January, 1931, pp. 15–19. It contains a review of the literature and a discussion of the factors responsible for the low incidence of tuberculosis in coal miners. The conclusions are as follows:

Pulmonary tuberculosis is relatively uncommon among coal miners, the mortality due to it being from one-half to two-thirds of that generally found for corresponding ages. Coal dust mixed with some rock dust which floats in the atmosphere of the mines penetrates to the pulmonary parenchyma and gives it a black color. But the coal provokes no inflammatory reaction ending in fibrosis; neither does it possess any antiseptic power toward tubercle bacilli. It has no influence on the development of tuberculosis. However, it may prevent accumulation of silica dust, which produces sclerosis and favors tuberculosis. Outside their work, coal miners enjoy generally favorable conditions of life which tend to maintain resistance to latent infection. The preventive effect of these conditions is enhanced by physical selection.

TUBERCULOSIS MORBIDITY AMONG INDUSTRIAL WORKERS. *L. Vajda. Beitr. z. Klin. d. Tuberk., Oct. 23, 1930, vol. 75, p. 564.*

UNDULANT FEVER AS AN OCCUPATIONAL DISEASE. *C. Dubois and N. Sollier. Méd. du travail, Jan., 1931, vol. 3, pp. 1–18.*

The claim is made that most cases of undulant fever occur among persons brought into contact with affected animals. The occupation of 480 cases was examined, and it was found that seven-eighths of the patients were either shepherds, farm servants, agricultural laborers and gardeners, butchers, or animal shearers; all other occupations accounted for only one-eighth of the whole. Infection for the general population is most often through food, and may be avoided if that food is sterilized or pasteurized; the infection here is indirect. By contrast, direct contamination arises occupationally from contact with ewes, goats, and cows, or with manure. Such direct occupational contact cannot be avoided by anyone who is compelled occupationally to come in

contact with infected animals. Hence, such workers should be granted compensation for this disease. Undulant fever is a long disease, with many sequelae; the average duration of an attack is four to five months. Fortunately, complete recovery is the rule. The French law relating to compensation for occupational diseases is discussed, and the conclusion reached is that undulant fever, as it occurs among shepherds, goatherds, and cowmen, is a disease to which, according to the principles of the Act, compensation should be extended.—E. L. C.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

INDUSTRIAL ECZEMA. *R. L. Mayer. Schrift. a. d. Gesamtgeb. d. Gewerbehyg., N. S. no. 30, 1930, pp. 89.*

Reviewed as follows in Arch. Dermat. and Syph., April, 1931, vol. 23, p. 822.

In this brochure of eighty-nine pages this subject of ever-increasing importance is treated in a concise and masterly manner.

In the first part the definition of eczema is discussed, bringing out the many transitional and borderline forms, but showing that there are typical, clinical and histologic criteria. The author agrees with the point of view of Jadassohn and Bloch concerning the uselessness of attempting to continue to separate dermatitis venenata and eczema as two different disease entities.

The rôle of sensitization in the pathogenesis of these eruptions is discussed, and the different parts played by the nature and concentration of the substances, the manner of the contact and the constitution and state of the patient are briefly outlined. The relationship of asthma, urticaria, lichen simplex, prurigo and eczema, as well as the analogies to anaphylaxis, is touched on.

Therapy and prophylaxis are discussed in the practical part of the book. It is demonstrated that the contact tests of Jadassohn, Bloch, and their pupils, by enabling an etiologic diagnosis, are most important aids in this field. Scratch and intradermal testing has proved of little or no value here.

A chapter is devoted to the manner and technic of testing and the evaluation of the results. Another chapter discusses the different occupations and the eczematogenous substances which are therein involved. Hints and suggestions are given for the regulation of factories and industries in which occupational eruptions occur, and the carrying out of practical prophylaxis. The German laws governing this type of occupational diseases are cited. There is appended an extremely useful list setting forth a large number of substances commonly causing eczema, together with the concentrations of these substances which cause no reaction on the skin of normal, nonsensitive persons.

OCCUPATIONAL DERMATITIS FROM ARSENIC. *P. Vigne. Abstr. as follows from Ann. de dermat. et syph., Nov., 1930, vol. 1, p. 1150, in Arch. Dermat. and Syph., April, 1931, vol. 23, p. 739.*

Vigne reports a thorough study of

occupational dermatitis from arsenic. His patients were workers in a chemical plant specializing in agricultural insecticides. The base of these products was arsenous anhydride, from which were elaborated sodium and lead arsenate, Paris green, etc.

The workers were protected by masks and gloves, but sometimes discarded them because they were inconvenient. The atmosphere of the plant contained a considerable quantity of the powdered products, especially where the laborers prepared the boxes and barrels of the chemicals for shipment.

Vigne gives ten case histories. Symptoms began to appear in from four to five days after exposure. The patients all showed symptoms of systemic arsenical effects, which varied considerably from case to case. The cutaneous manifestations were of two types: superficial vesicular, vesicobullous, crusted dermatitis localized chiefly on the face and the scrotum, and ulcerations mainly occurring on the extremities. The former lesions disappeared promptly under appropriate measures; the latter, however, responded slowly.

Microscopic examination of a vesicular and crusted lesion revealed profound necrosis, especially affecting the cellular elements of the epidermis and derma without involving the collagen, and an abundant polymorphonuclear infiltration.

By application of the chemicals to the skin, the author was able to produce lesions similar to those encountered in the occupational disease. He found that arsenous anhydride produced the most powerful and prompt effect. In fact, this anhydride and its compounds seemed alone capable of producing the conditions found clinically. Experimentally, the application of the dry or moistened powder (anhydride or Paris green) to the dry, sound skin produced no manifestations unless certain conditions were present. These conditions were mainly the presence of seborrhea, sweat, saliva, etc.—organic secretions which fixed the chemical and favored its action by maceration. These conditions sufficed for the development of the superficial lesions; for the ulcerations, excoriations, fissures or traumatism permitting the penetration of minute amounts of arsenic were required.

Vigne also discusses the medicolegal aspects of this occupational dermatitis. In France the law does not permit compensation to the workers, requiring only that certain precautions be taken to protect them. It is evident that the law should be modified in favor of the workers, and a movement is on foot to change it.

SKIN INFECTION IN SALMON FISHERMEN IN ALASKA. *H. N. March and M. S. Marshall. Abstr. as follows from Proc. Soc. Exper. Biol. and Med., 1929, vol. 27, pp. 106–108, in Bull. Hyg., Oct., 1930, vol. 5, p. 761.*

Fishermen handling salmon at Bristol Bay in Bering Sea suffer from a skin infection. Pain and a dark red swelling develop, usually on the hand, with malaise and temperature between 99° and 100°F. The hand and wrist may become edematous, with large and tender axillary glands. A blister containing turbid serum forms. Disability lasts for seven to ten days. Healing occurs by separation of the

epidermis. Cultures from the lesions, when studied at San Francisco, showed the presence of rather large gram-positive cocci, tending to occur in pairs, and occasionally in short chains of three or four cells. So far the disease has not been reproduced in animals. (Nor has the exact occupational origin of the cocci been determined, although the cocci were found in fish slime.)—E. L. C.

AN INVESTIGATION INTO THE EFFECT UPON THE EYES OF OCCUPATIONS INVOLVING CLOSE WORK. *W. S. Duke-Elder. Abstr. as follows from Brit. Jour. Ophth., Dec., 1930, vol. 14, p. 609, in Am. Jour. Ophth., March, 1931, vol. 14, p. 284.*

This investigation concerns itself with 244 printers' apprentices aged 14 to 20 years. Four successive examinations, at intervals of nine months, were conducted. Observations were made of the visual acuity, the refractive error, the power of accommodation, the muscle balance, and the degree of binocular and stereoscopic vision. In the group were compositors, machinists, binders, lithographers, stereotypers, and general students.

A résumé of the results is presented in statistical form. Reviewing the figures, it is obvious that the compositors do not well bear comparison with those engaged in other occupations. Not only do they present initially a considerably higher percentage of myopes, but the number in which the refractive error increases toward myopia is also higher. Moreover, the percentage suffering from a considerable amount of muscular imbalance is higher.

OCULAR LESIONS DUE TO ACCIDENTS IN WORKERS IN THE GLASS INDUSTRY. *J. Badot. Abstr. as follows from Bull. Soc. belge d'opht., 1930, no. 60, p. 10, in Am. Jour. Ophth., March, 1931, vol. 14, p. 280.*

These lesions vary extremely in seriousness. The author notes the extra hazard of even superficial corneal wounds in cases of dacryocystitis. Hot particles of glass cause wounds that require longer to heal. Careful examination with the corneal microscope is a most useful aid to diagnosis. The treatment outlined does not differ from the classical treatment of corneal and scleral wounds due to other substances than glass. Conjunctival flaps are recommended in appropriate cases.

It is noted that small bits of glass may be tolerated by the eye indefinitely. Coppez mentioned a case in which a small bit of glass lodged in the vitreous just back of the lens and was tolerated for thirty years. There was no inflammation and the vision was useful. Another patient carried a small bit of glass in the iris without irritation for twenty years.

Kleefeld called attention to the use of ultraviolet light to demonstrate the presence of glass in the lens substance. When ultraviolet light is used for illumination the bit of glass, being nonfluorescent, becomes "invisible"; its form and limits are indicated by the fluorescent lens substance in which it is imbedded.

GLASSES FOR PROTECTING THE EYE FROM GLARE. *W. W. Coblentz. Jour. Am. Med. Assn., Aug. 23, 1930, vol. 95, pp. 593–594.*

The federal specifications for the

protection of the eyes of industrial workers from injurious radiation specifies that "shade No. 3 filter lenses are intended for glare of reflected sunlight from snow, water, roadbeds, roofs, sand, etc." The mean transmission of visible light through a shade 3 glass is 13.9 per cent., and the tolerance ranges from a maximum of 23 per cent. to a minimum of about 9 per cent. The specification requires a fairly high absorption of ultraviolet and infra-red rays, which means that the color of the glass is greenish.

The next lighter shade is 2, with a maximum transmission of 60 per cent., a minimum transmission of 23 per cent., and a mean value of 37.3 per cent. But there is no provision in the Safety Code for the use of such a light shade. This is partly owing to the fact that no chances are being taken of possible injury, with attendant legal complications regarding compensation for alleged injury.

Recently, practically colorless glasses have been put on the market. These have approximately the same transmission as common spectacle glass for infra-red rays. They transmit 85 to 90 per cent. of the visible rays, while ordinary white crown lenses transmit 91 per cent. when perfectly clean, and from 85 to 90 per cent. as commonly worn. They offer no protection from the glare of bright light (visible radiation) emanating from highly reflecting objects. The author's personal experience indicates that when the light is uncomfortably bright, it is necessary to use a shade 3 glass (colored or "smoke") in order to relieve the discomfort from glare.—M. C. S.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

CONDITIONS ACCOMPANYING MAXIMUM WORK PRODUCTION IN MAN. *L. Schmidt-Kehl. Arch. f. Hyg., 1928, vol. 100, no. 5–7, pp. 226–244.*

Comparative work experiments (ball raising) were conducted on a rather delicate child, on two moderately robust adults, and on a trained athlete.

When the maximum amount of work was accomplished, two-thirds of the increase in ventilation caused by the effort occurred, in the case of the child, in the three-minute work period, and one-third in the succeeding recovery period; the athlete responded in the reverse manner. The more robust subjects exhibited a tardier increase in ventilation than the weak subject.

During the course of the work, the child absorbed more than four-fifths of the oxygen demanded for maximum output, while the athlete required only one-half; in addition, the athlete could produce a far greater oxygen debt. The greater the production of work, the more difficult it is for the body to increase the output through further postponement of oxygen absorption. The athlete was capable of producing five times as much work as the child but incurred fourteen times as great an oxygen debt.

Similarly, with maximum output the child produced four-fifths, the athlete only two-fifths of the carbon dioxide excreted during the work.

Because of increased carbohydrate metabolism, the respiratory quotient was greater in all subjects during the work and recovery periods, and varied directly with the strength of the subjects. The alkali reserve also increased with the strength of the subjects and, as a result, the possibility of the expulsion of carbon dioxide through lactic acid.

The efficiency of the work decreased with increased output, owing to the greater co-movement; but with maximum production it was identical in all subjects. In the case of equal work production, the number of calories spent per kilogrammeter varied inversely with the strength of the subjects. The limit of work capacity was attained when the degree of efficiency was less than 8 per cent. and the number of calories exceeded 30. Therefore there was no basis for the supposition that the strong subject produced maximum work more economically than the weak.

With the same task, difficult for weak and easy for strong subjects, the blood of the strong subjects showed a small amount of lactic acid, that of the weak a large amount; this is due to the more abundant alkali reserve in the muscles of the strong.—A. M.

THE DRINKER RESPIRATOR. ANALYSIS OF CASE REPORTS OF PATIENTS WITH RESPIRATORY FAILURE TREATED FROM OCTOBER, 1928, TO JUNE, 1930. *P. Drinker, T. J. Shaughnessy, and D. P. Murphy. Jour. Am. Med. Assn., Oct. 25, 1930, vol. 95, pp. 1249–1252 (discussion, pp. 1252–1253).*

This report consists in a brief summary of the cases treated in the respirator regarding which complete information is available. These include acute anterior poliomyelitis, gas poisoning, alcoholic coma, drug poisoning, drowning, postoperative respiratory failure, and asphyxiation of the newborn.

In general, in acute poliomyelitis respiratory failure is relieved and cyanosis is prevented. Whether or not a patient acutely ill will recover as the result of the respirator's having tided him over the most critical part of the illness is unpredictable. Most of the carbon monoxide cases are the result of attempted suicide, generally complicated by serious ill health. They are not typical "gas poisoning" cases. The usual type of accidental carbon monoxide poisoning can be treated fully as well by the oxygen and carbon dioxide inhalation method alone as by the respirator. In the treatment of infants who do not respond to the customary respiratory stimuli at birth, the respirator seems particularly applicable.

The authors believe that contraindications for the use of the respirator are simply those of observing the patient's reaction. If the patient is not suffering from respiratory difficulty or is not cyanosed, there is generally no point in using the respirator. If the patient does not respond to the treatment and does not spontaneously breathe in synchronism with the machine, the artificial respiration may actually interfere with his voluntary breathing and certainly does no good.

THE TREATMENT OF RESPIRATORY ARREST IN THE DRINKER RESPIRATOR. A CLINICAL AND EXPERIMENTAL STUDY. *D. P. Murphy, C. K. Drinker,*

and P. Drinker. Arch. Int. Med., March, 1931, vol. 47, pp. 424–435.

1. Clinical and postmortem data for two adults and six infants treated for respiratory failure in the Drinker respirator are given.

2. These data show that for long periods the respirator should be used with as low negative pressures as possible, not more than 25 cm. of water for the adult and 10 cm. of water for the infant.

3. Patients with the combination of an exudative process in the lungs and respiratory paralysis make little progress when placed in the respirator. At autopsy they show hemorrhagic lesions which, in our opinion, may have arisen following bronchiolar plugging and atelectasis. Such patients should always be treated in the head-down position and changed from back to side if it is possible to do so.

4. Infants should not be subjected to negative pressures greater than 10 cm. of water for long periods, and they should invariably be treated with the head down at an angle of from 10 to 15 degrees.

5. Experiments on animals that bear on these points are discussed.—*Authors' Summary.*

INDUSTRIAL ENVIRONMENTAL CONDITIONS

Improved Drinking Facilities in Places of Employment. *M. Correll. Municipal Sanitation, Feb., 1931, vol. 2, p. 71.*

The United States Bureau of Labor has inspected 1,500 industrial establishments in twenty-one states. Studies indicate that more care should be taken to protect workers against the spread of disease by insanitary drinking fountains. The common cup was found in every state, including one-fourth of the establishments. Over 40 per cent. of the establishments had bubbling drinking fountains but less than 4 per cent. had angle-jet fountains throughout. Individual drinking cups were provided in only 10 per cent. of the plants.

No state law requires only individual drinking cups and only one requires angle-jet fountains. Seventeen states recommend the sanitary angle-jet type of bubbler approved by the American Public Health Association. In the interests of public health, effort should be made to secure more general adoption of the sanitary fountain.—T. H.

The Effect of Distribution and Colour on the Suitability of Lighting for Clerical Work. *Dept. Sci. and Indust. Res., Illumination Res., Tech. Paper No. 10, pp. 14. H. M. Stationery Office, 1930. Abstr. as follows in Bull. Hyg., Jan., 1931, vol. 6, p. 22.*

This research was designed to show whether, with artificial light of adequate intensity, any advantage results from making it conform—either in color or distribution—to normal daylight.

A room was lighted alternatively by sources of equal and adequate intensity, but differing with regard to:

Source.—(*a*) The source was a ceiling bowl which gave semi-indirect light, and (*b*) bulbs placed between

the bow window and an outside wooden casing, so that the only light entering the room diffused through thin paper covering the window—thus simulating the normal distribution of daylight through the room.

Color.—Both the foregoing sources consisted alternatively of: (i) electric bulbs of the usual yellowish-colored filament, and (ii) bulbs of the faint bluish tint of "artificial daylight."

Clerical workers were employed for several days under each of the four combinations of distribution and color of light thus made possible, and their opinions and rates of work were recorded. The conclusions were that:

1. The color of artificial daylight is preferred to that of the usual bulb.
2. The distribution by window is preferred to that from ceiling, the latter being improved by addition of light-diffusing wall panels.

The conclusions drawn from prolonged full-scale tests in various government offices were disappointingly inconclusive in comparison. The preference for artificial daylight was indefinite, and no reduction in candle power was found possible as a result of using that hue. There appeared, however, a general marked preference for a system combining general lighting with individual light-points over working planes.—P. S. L.

A Flame Safety Lamp of High Candle Power. *D. W. Woodhead. Safety in Mines Res. Board, Paper No. 65. H. M. Stationery Office, 1931.*

The incandescent mantle has long been utilized for increasing the light of the domestic oil lamp and the same principle has been used in miners' lamps for some years on the Continent, although to a limited extent. The Safety in Mines Research Board, with the assistance of the Flame Lamp Association, has developed an improved design which has proved satisfactory in laboratory tests and will shortly be subjected to prolonged trial under mining conditions. A description of this lamp, which gives a light initially of 9 candle power, falling gradually to about 6 at the end of ten hours, is now published. Few ordinary flame lamps give as much as 1 candle power of light. The importance of increased light from miners' safety lamps is concerned with preventing miners' nystagmus, a distressing complaint due to working in dimly lighted coal seams.

INDUSTRIAL PSYCHOLOGY AND INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS

Personnel Research Agencies. 1930 Edition. *U. S. Bur. Labor Statistics, Bull. No. 518, June, 1930, pp. 197.*

This bulletin is a continuation of Bulletin No. 299, which was designed as "a guide to organized research in employment management, industrial relations, training and working conditions," and which brought the data down to 1921. Agencies are grouped under two main heads: official—federal, state, and municipal; and non-official—associations, foundations, research bureaus, institutions, manufacturing and business establishments;

universities and colleges. A reference list is given of the various agencies classified according to type of activity, as follows: employment management (personnel work); industrial relations; working conditions (hours of labor, fatigue, and efficiency); employment (placement); unemployment; turnover; safety (accidents, standards, codes); industrial hygiene (occupational diseases); industrial morbidity and mortality; industrial psychology; intelligence, trade, and aptitude tests; training (vocational education); cost of living (budgets); pension plans (retirement systems); employment of women; child labor (vocational guidance, juvenile placement); handicapped and disabled workers; psychopathic and mentally deficient workers; foreign-born workers; colored workers; and public employment.

PSYCHIATRY IN INDUSTRY AND COMMERCE. *I. M. Altshuler. Michigan State Med. Soc. Jour., June, 1930, vol. 29, p. 451.*

INDUSTRIAL PSYCHOLOGY APPLIED TO THE BLIND. *C. B. Fox. Jour. Nat. Inst. Indust. Psychol., April, 1931, vol. 5, pp. 334–343.*

Visits were paid to the principal training institutions and workshops for the blind, and their occupations studied in detail. It appeared that blind persons can acquire real skill only in those activities which are truly independent of vision in the sense that *effective* substitutes for visual control can be developed. Tests of manual dexterity showed that the totally blind were much slower than those who could see a little, as they lost so much time groping for material. As a rule, their earning capacity improved for a period of ten or eleven years, and thereafter decreased. Owing to their lack of vision the blind are largely isolated and tend to brood; therefore team work was introduced, and this tended very noticeably to break down the isolation. In basket manufacture it was found that if the individual workers concentrated on different parts of the baskets instead of making entire baskets, their collective output improved 25 per cent. On combining normal-sighted girls with blind girls, it was found that a team made up of three of the former and four of the latter attained 91 per cent. of the output of normal-sighted teams, when engaged on a packing occupation. When special attention was paid to the layout of material, the time wasted by blind workers in groping for material and for their implements was considerably reduced, and an improvement of 10 per cent. in output was noted.—H. M. V.

SUPERVISION AND MORALE. *E. Mayo. Jour. Nat. Inst. Indust. Psychol., Jan., 1931, vol. 5, pp. 248–260.*

Six women engaged in assembling telephone relays were kept under close observation in a special test room for a period of two and one-half years, during which their conditions of work were changed from time to time. A complete record of the output of each girl was kept for every fifteen minutes of each day, the records of production being first taken for a fortnight in the regular department, under ordinary working conditions and without the operator's knowledge. During the experimental period the output gradually

improved 26 per cent., partly because of the introduction of rest pauses. A rest of fifteen minutes in the morning and ten minutes in the afternoon appeared to give slightly the best result. When the workers returned to their original conditions of work, production continued to improve as before; on further investigation it appeared that the selected girls showed a lower and steadier "pulse product" than the workers in the department outside, while they suffered only about a third as much loss of time from sickness. The attitude of the girls to their work and to their superior officers had greatly improved, owing to increased friendliness and sympathy between them. It was found that whereas supervisors are generally talkers and drivers, those who got the best results were the good listeners. The firm consequently decided to interview all their 40,000 employees, the employees talking on any topic they chose for as long as they liked to a trained listener provided by the company.—H. M. V.

THE PSYCHOVISUAL REQUIREMENTS OF AUTOMOBILE DRIVERS. *M. Menacho. Abstr. as follows from Arch. de oftal. hispano-am., June, 1930, vol. 30, p. 310, in Am. Jour. Ophth., March, 1931, vol. 14, p. 285.*

Good central visual acuity is not sufficient for a driver. He must possess depth perception and have at least 70 degrees of visual field temporally. A glaucomatous person with fields contracted to 5 degrees is a dangerous person even if he possesses normal central acuity. On the basis of a study of average speed of drivers, effectiveness of brakes, and conditions of traffic, the author proposes the following requirements: The sum of the uncorrected acuities of the two eyes in professionals should be not less than 20/20, and the poorer eye should have at least 20/100; thus if one eye has 20/40, the other eye must have at least 20/40. The same, if corrected, is required of private owners. Intact fields increase the efficiency of an eye with low acuity in night driving. The author would disqualify all cases of strabismus, whether concomitant or paralytic; and also persons with hemeralopia, trachoma, or any other condition subjecting the sufferer to lacrimation. In view of the great prevalence of red-green blindness he would substitute for or incorporate with the lights used for traffic signals large size figures to indicate their purpose. An X in black over white would serve to halt traffic, two parallel lines to signal "go," and a large question mark would stand for attention.

MEDICAL FOUNDATIONS FOR THE ESTIMATION OF PHYSICAL AND MENTAL CAPACITIES NECESSARY IN AUTOMOBILE DRIVERS. *O. Franz. Schweiz. med. Wchnschr., June 7, 1930, vol. 60 p. 534; June 14, 1930, p. 553.*

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

FACTORY AND WORKSHOP. WELFARE. THE CEMENT WORKS WELFARE ORDER, 1930, DATED FEBRUARY 12, 1930. *Statutory Rules and Orders, 1930, No. 94. H. M. Stationery Office, 1930, pp. 2. Abstr. as follows in Bull. Hyg., Dec., 1930, vol. 5, pp. 968–969.*

These indicate to the occupier of such premises *inter alia* that he must provide: (1) water-tight thigh boots; (2) suitable goggles; (3) suitable waterproof coats; and (4) suitable overalls and head coverings for female workers. Accommodation must also be provided for clothing put off during working hours. Seats must be provided for giving rest to those who are required to do work standing. Messrooms and adequate dining tables must also be provided, together with facilities for warming food and boiling water. Washbasins are also demanded by these new Orders.—W. R.

THE LAW PERTAINING TO INDUSTRIAL ACCIDENTS. *B. Rossi. Clin. chir., Aug., 1930, vol. 33, p. 879.*

SCHEDULED INDUSTRIAL DISEASES IN GERMANY. *L. Teleky. Abstr. as follows from Assicurazioni soc., May-June, 1930, vol. 6, in Bull. Hyg., Jan., 1931, vol. 6, p. 19.*

Dr. Teleky, the Medical Inspector of Factories stationed in Düsseldorf, with a large industrial area under his supervision, deals in this article with the twenty-two occupational maladies which have been brought under the Accident and Invalidity Insurance Law. Compensation becomes payable only after the twenty-six weeks under the Sickness Insurance Law have elapsed.

Although drawn up on our English model (many of the maladies and forms of poisoning being the same), the interesting thing about the German list is that at least seven maladies do not appear in our list at all, while others, such as nystagmus, which one would expect to see scheduled, are not. Thus, the diseases which do not appear in our list, or are scheduled under stricter limitations are:

Chronic and recurrent skin diseases from galvanizing processes.

Chronic and recurrent skin diseases from some foreign woods.

Chronic and recurrent skin diseases from soot, paraffin, tar, anthracene, pitch, and allied substances.

Diseases of the muscles, bones, and joints from the use of pneumatic tools.

Diseases of the deeper air passages and lungs from basic slag.

Severe diseases of the lung due to dust (silicosis); or tuberculosis accompanying silicosis.

Schneeberg lung disease.

Deafness or hard-hearing bordering on deafness caused by noise.

The Schneeberg lung cancer is of course confined to a small district in Germany; nothing like it is found in Britain. Basic slag is not largely produced in Britain because the kind of phosphoric ores found in Germany are much more amenable to the Thomas-Gilchrist process.

The scheduling of deafness due to noise is interesting as this trying defect is a notable instance of the fact that in our own country compensation is given for incapacity and not merely for

being the victim of a specific malady contracted from employment.

The German medical press is now exercised over the questions "When is a skin malady to be described as chronic?" and "When is silicosis to be described as 'severe'?" the general conclusion being that the code must shortly undergo revision.—T. M. L.

TRAUMA, DISEASE, COMPENSATION: A HANDBOOK OF THEIR MEDICO-LEGAL RELATIONS. *A. J. Fraser. Philadelphia, F. A. Davis Co., 1930, pp. 524.*

Reviewed as follows in Jour. Am. Med. Assn., Dec. 6, 1930, vol. 95, p. 1769.

The author has compiled the opinions of physicians, surgeons, industrial boards, and courts concerning the relations of many diseases and injuries to trauma of all kinds and to other occupational hazards. These opinions range over the entire medical field, from status lymphaticus, angioneurotic edema, and auricular fibrillation to hernia, fractures, caisson disease, and injuries to the spinal cord. The book thus affords ready access to many important opinions. Its usefulness is greatly diminished, however, by the looseness of its citations to original sources. Most readers, in order to learn the facts, hypotheses, and theories on which the opinions are based, will find it necessary to read them in the words of those who expressed them. Without such appraisal, the weight to be given an opinion cannot be determined by courts and industrial boards, and the opinion is of no value to the expert witness in formulating his own opinions and supporting them in the face of cross-examination. Statements of the exact sources of the opinions abstracted, giving the year of publication and citing volume and page numbers, would have relieved from much labor those who use the book and would have added greatly to its usefulness.

RECENT COMPENSATION DEVELOPMENTS. *L. H. Childs. Michigan State Med. Soc. Jour., June, 1930, vol. 29, p. 446.*

MEDICOLEGAL ASPECTS OF OCCUPATIONAL DISEASES. *M. Kummel. New Jersey Med. Soc. Jour., May, 1930, vol. 27, p. 443.*

The author considers chiefly occupational diseases due to exposure to poisons, which are practically the only occupational diseases compensable under the laws of New Jersey. He lists the principal legislative remedies of foreign countries and points out some of the contradictions and deficiencies in the New Jersey law. He considers that the ideal solution would be a blanket law covering all occupational diseases; since conditions do not warrant this at present, he suggests adding to the list from time to time the most common and prevalent occupational diseases.

MEDICOLEGAL ASPECTS OF LOW BACK INJURIES. *M. Kummel. Reprinted from New Jersey Med. Soc. Jour., 1930.*

Estimation of permanent disability is not based on personal opinion or past experience, but on actual measurement of functional disability. Careful history of the type of trauma and mechanism of injury is essential.

Diagnosis must be made and confirmed by all means available. Extent of the normal range of motion should be familiar to the examiner. When preexisting condition is demonstrable, the amount of disability allowed should be for the aggravation only. Malingering can be easily detected in the examination of back injuries.

ACCIDENT (WAR) NEUROSES. *Martineck. Berlin, Reimar Hobbing, 1929, pp. 144.*

Reviewed in Arch. Neurol. and Psychiat., April, 1931, vol. 25, pp. 920–933.

This book contains a symposium on the war and traumatic neuroses, setting forth the opinions of leading German authorities, and is used for purposes of instruction by the German Department of Labor, especially by physicians engaged in the handling of compensation cases. The executive officer of the German Department of Labor requested Kronfeld, Leppmann, Joszman, Stier, Hoche, Wilmanns, and Knoll to discuss current medical opinion in regard to the question of hysteria and to express their convictions or attitude toward the following questions:

Are persons with nervous manifestations (hereafter interpreted by the German Department of Labor always as reactive, neurotic, and not organically determined symptoms) eligible for compensation: (1) when, after some external accident, the symptoms become manifest for the first time many years later; (2) when they appear once again (in the same, a similar, or a completely different way) after prolonged absence or extensive improvement; (3) when, after remaining stationary for many years, they become worse; (4) when, compensation once awarded, they still continue to exist unchanged for many years?

Chapter 2 comprises a series of addresses by the various authorities mentioned on the subject in point.

J. I. H.
June, 1931

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

ON THE QUESTION OF OCCUPATIONAL CANCER OF THE HANDS. *A. A. Epstein. Abstr. from Zentralbl. f. Gewerbehyg., Sept., 1930, N. S. vol. 7, pp. 256–263, in Bull. Hyg., March, 1931, vol. 6, p. 262.*

The core of this contribution is found in an interesting account of the manipulation of the blowpipe by the glass blower as producing various lesions of the hands culminating occasionally in epitheliomatous ulceration.

Of ninety glass blowers with a duration of employment from two to fifty-five years Epstein found wheals in all, pigmented wheals in five, wheals in the form of flat plaques in eighteen, rhagades in thirty-three, warts in ten, and Dupuytren's contraction in all. He introduces a general table giving the occupation of fourteen groups in whom cancer has been shown to occur, the material causing it, the age of the affected persons (between 35 and 78 years), the duration of the employment (fifteen to forty-five years). This would appear to be merely illustrative. He reproduces also Kennaway's table of the localization of the cancer according as arsenic, pitch and tar, and mineral oil are the causative factors, and makes frequent reference to his and other work done in England.—T. M. L.

GOITRE AND ITS RELATIONSHIP TO INDUSTRY. *C. K. P. Henry. Abstr. as follows from Canadian Med. Assn. Jour., 1930, vol. 23, pp. 51–53, in Bull. Hyg., March, 1931, vol. 6, p. 264.*

The mental and emotional strain of certain occupations, for example operating telephones, calls for increased activity on the part of the thyroid gland, which as a consequence is liable to show signs of disturbed function. Those people whose thyroids become obviously enlarged at the age of puberty are more liable than others to exhibit signs of hyperthyroidism under the stress of exacting occupations. It is suggested that young persons seeking employment should be examined for adolescent goiters, and where such are found, the subjects should be recommended to lead a relatively quiet life and to take an adequate but physiologic supply of iodine, preferably in the form of natural foods rich in iodine. These individuals need not be debarred from employment, but they should be examined periodically for the appearance of symptoms of hyperthyroidism. —S. J. C.

NEUROSES AND THE PUBLIC HEALTH. *M. Culpin. Pub. Health, March, 1931, vol. 44, pp. 169–174.*

The facts used in this discussion are drawn mainly from occupational sources. In long period illness, nervous diseases produce between 30 and 40 per cent. of all cases of disablement, and about one-quarter of all claims. A discussion follows as to what conditions are included under the group of nervous diseases, and reference is made to considerations of this group of complaints by earlier writers. There is a tendency to use indiscriminately such terms as nervous instability, neurasthenic temperament, nervous disposition, nervous weakness, neurosis, neurotic debility, psychosis, and nervous exhaustion; while shell shock and railway spine are efforts to claim physical trauma as the causative agent. The author then picks out the occupational neurosis miners' nystagmus, to illustrate many points in his argument, and shows that every sign or symptom of this trouble, except the oscillation of the eyeballs, is a matter of emotion or behavior which concerns the man as a whole. For the miner working in the bowels of the earth, with falls of roof and explosions as constant risks, in darkness made visible by safety lamps that emphasize danger, the way of escape from these conditions is by illness, when this illness establishes a compensation claim. Nevertheless, the disability is a true neurosis rather than a case of malingering. The large group of disabilities, of which this disease is a sample, calls for an entire revision of outlook on the part of the medical profession with regard to both prevention and treatment.—E. L. C.

A VASOMOTOR DISTURBANCE IN THE FINGERS OF STONECUTTERS. *A. Hamilton. Arch. f. Gewerbepath. u. Gewerbehyg., 1930, vol. 1, no. 3, pp. 348–358.*

Dr. Hamilton summarizes here the findings in an investigation which was made among stone cutters in the United States during 1918,[1] but which has escaped general notice owing to the fact that it appeared in a government publication issued during the War.

[1] Effect of the Air Hammer on the Hands of Stonecutters. U. S. Bur. Labor Statistics, Bull. No. 236, 1918, pp.147.

Discovery of a similar condition in shoemakers, by German factory inspectors in 1927, has made it desirable to review the American study.

Examination of 181 stone cutters demonstrated the presence of marked vasomotor changes and decrease of sensation. The vasomotor nerves of the hands were abnormally sensitive and reacted in a manner never seen in normal conditions. As the sensitiveness of the vasomotor nerves to mechanical stimuli was most marked in the parts of the body which were in closest contact with the vibrating pneumatic tool, it is evident that the vibrations of the tool must be considered as the cause of the vasomotor disturbances found in the men.

No symptoms of a dangerous character were found and the condition cannot be said to be of serious consequence to the general health of the men. It is, however, impossible to state that it would not finally have an unfavorable and even serious influence upon the health of the men (or some men). It cannot be denied that the condition of the hands of the men observed is a handicap, preventing them from choosing certain occupations and thereby limiting their freedom.

Two case histories, with illustrations, are included. The figures are intended to show the character of the disturbances and their localization, but much of their value is lost by the unfortunate omission of explanatory matter.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

FOG CATASTROPHE IN INDUSTRIAL SECTION SOUTH OF LIÉGE. *W. S. van Leeuwen. Abstr. as follows from München. med. Wchnschr., Jan. 9, 1931, vol. 78, p. 49, in Jour. Am. Med. Assn., April 18, 1931, vol. 96, p. 1347.*

Storm van Leeuwen describes the fog catastrophe in the valley of the Meuse, during which hundreds of persons became ill and sixty-three died. On December 1, a Monday, a fog developed in Belgium and in the Netherlands. In the valley of the Meuse the fog was especially heavy, and on account of an absolute calm it did not lift until Thursday afternoon. On Friday it again became foggy and it remained so until Sunday. On Tuesday and Wednesday the fog was especially heavy. On Wednesday a large number of persons complained of irritations in the nose, mouth, throat, trachea, and bronchi. The mucous membranes were red and swollen. Necropsies later revealed that these inflammations reached down into the large ramifications of the bronchi. The patients coughed and the respiration frequency was more than 40 a minute. In the serious cases dyspnea, dilatation of the heart, high pulse frequency, and cyanosis developed. Signs of pneumonia were not present. Injections of epinephrine brought temporary improvement, and cardiac stimulants were also administered. Among those who were seriously ill, and especially among those who died, there were many old persons, also persons with asthma, bronchitis, and heart disease. However, it was also noted that young persons who had been healthy before

became seriously ill and that many others felt an unpleasant irritation in the throat. The sixty-three fatalities all occurred within twenty-four hours and in the narrow valley south of Liége. In discussing the causes of the catastrophe the author points out that the opinion that the heavy, cold fog is irrespirable and that the fatalities were due to suffocation from lack of oxygen is not tenable because heavy, cold fogs are quite frequent on the sea coast of the Netherlands, and yet there are no fatalities. The theories of war gases and of Sahara sands are likewise dismissed. In traveling through this region the author noted numerous factories, such as zinc industries, superphosphate factories, and other industrial plants. It may be assumed that even under normal conditions the air contains irritative substances such as sulphur dioxide and hydrofluoric acid. It is also known that this region is fit for neither agriculture nor cattle raising. That this is due to the presence of the factories is proved by the fact that the cattle raisers had a lawsuit against the manufacturers and were paid damages. The cold and heavy fog and the absolute calmness during the first days of December prevented ventilation, and it is also possible that some of the factories discharged an abnormally large amount of poisonous substances during these days. This catastrophe teaches that the harmfulness of gases discharged by certain industries should not be estimated on an ordinary day but that the concentrating effects of fogs should be taken into consideration.—C. K. D.

Toxic Effects of Dust in Industry. *E. Kohn-Abrest. Abstr. as follows from Méd. du travail, 1930, vol. 1, pp. 239–261, in Bull. Hyg., March, 1931, vol. 6, p. 230.*

A few disconnected observations are presented. A student worked some months filing lead plates in a factory and had a slight attack of lead poisoning. Two months after giving up this work he died suddenly in an epileptiform attack. Traces of lead were found in all the organs of the body. Zinc is not harmful; but its compounds are often contaminated with arsenic, most of which volatilizes at high temperatures more easily than zinc. Arsenic is an impurity in pyrites and so gets into the air from coal fires. The body of a mule kept near a factory making organic arsenic compounds was found to contain arsenic. Details are given of experiments in which guinea-pigs were fed with the sesquioxide and sulphate of chromium with no poisonous effect. The animals even increased in weight. Chromium normally exists in the human body. Chromic acid and the chromates, owing to their active oxydizing properties, are harmful astringents; their fumes and dust when inhaled erode the nasal septum. They should be carefully controlled in factories, particularly in chrome plating where the acid is carried into the air by bubbles rising from the electrolytic bath. Experiments are quoted to show that when steam is thrown down as snow, gases present are not affected, but the water is pure; sulphuric acid, hydrochloric acid, and ammonia were used. This method cannot then be used for bringing down chromic acid or chromates. Both nickel and mercury were detected in the blood, urine, and hair of a woman, employed with slight exposure

to these metals, who suffered from metallic poisoning; normally nickel is not toxic. Experiments on guinea-pigs with salts of tungsten and molybdenum showed them to be slow poisons causing death with symptoms of asphyxia, tungsten being more toxic than molybdenum.—E. L. C.

TOXICOLOGY AND HYGIENE OF THE CONDITIONS MET IN OPERATING MOTOR CARS. EXHAUST GAS AND BENZINE. *E. Keeser, V. Froboese, R. Turnau, E. Gross, G. Ritter, E. Kuss, and W. Wilke. Schrift. a. d. Gesamtgeb. d. Gewerbehyg., N. S. no. 29, 1930, pp. 106. (Translation of Authors' Summary, p. 95.)*

There is no doubt that carbon monoxide is the single acutely poisonous component of exhaust gas. On account of the extraordinary rapidity of dilution, carbon monoxide concentrations of 0.02 per cent. are seldom encountered even in very thick traffic. Danger to people in the streets is consequently nonexistent.

On the other hand, there is danger for persons who must remain for hours in the heaviest sort of traffic or in places such as garages and repair shops where the possibility of the accumulation of exhaust gases exists. Such places require careful regulations for protection; even then, absolute safety cannot be assured.

Little damage occurs through automobile fuels; there should, however, be regulations against any annoyance from fuels and from oil engendered smokes.

The problem of chronic damage is for the time being still wholly unexplained. The lung changes ascribable to condensates from exhaust gas should be viewed with especial care. To what chemical compounds these changes are to be ascribed is still unknown.

The possibility of acute poisoning under special conditions, the unexplained problem of chronic poisoning, and, finally, the protection of the populace from motor exhaust gases are important problems which confront the investigator who must find workable methods of protection in all cases. —C.K. D.

THE EFFECT OF CARBON MONOXIDE ON THE "BARRIER" APPARATUS OF THE BRAIN. *A. M. Grünstein and N. Popowa. Abstr. as follows from Ztschr. f. d. ges. exper. Med., 1930, vol. 70, pp. 120–139, in Ber. ü. d. ges. Physiol., Feb. 11, 1931, vol. 58, p. 124.*

Aqueous solution of trypan blue (0.048 gm. per kilo) was injected in dogs and rabbits. Dye was never seen in the parenchyma of the nervous system. Following several injections, grains of dye were found in the histocytes of the plexus and once in the pia. The result was no different when the animals were poisoned with carbon monoxide (twelve times; 0.25 per cent. in air). The "barrier"[1] apparatus of the brain underwent no change in the sense of increased permeability. This contradiction of Stern's results is explained by the authors by the fact that they used pure carbon monoxide, whereas Stern used illuminating gas; moreover, they used weaker concentration (0.25 per cent. instead of 10 to 20 per cent.).—S. C.

[1] "Barrier" is used to denote the tissue wall between blood and cerebrospinal fluid, between blood and brain cells, or between brain cells and cerebrospinal fluid.

EXPERIMENTAL LESIONS OF THE BRAIN FROM CARBON MONOXIDE. *C. B. Semerak and L. H. Bacon. Abstr. as follows from Arch. Path., Dec., 1930, vol. 10, p. 823, in Jour. Am. Med. Assn., Feb. 28, 1931, vol. 96, p. 718.*

Experiments made by Semerak and Bacon demonstrate that the effect of carbon monoxide varies in different animals; that it is rapidly eliminated by rabbits and guinea-pigs; that rabbits are especially resistant to the gas, and that the weight of the animals, the amount of the gas, and the manner of administration modify its action. Symmetrical lesions in the brains of the dogs and more rarely in those of guinea-pigs and rabbits, lesions resembling those occasionally found in human brains, may be produced experimentally by injecting the gas into the arterial blood stream or by having the animals inhale pure carbon monoxide or illuminating gas. When pure carbon monoxide is injected into the blood stream, it combines so rapidly with the hemoglobin that gas embolism does not occur, or at least not with doses such as were injected in these experiments. Ten c.c. of air alone injected into the carotid arteries of dogs causes severe convulsions, is more frequently and speedily fatal than a similar amount of carbon monoxide, and results in fewer gross changes, these being rarely in the basal ganglions.—C. K. D.

PERIPHERAL PARALYSIS IN TWO MEN HAVING UNDERGONE THE SAME ASPHYXIA BY CARBON MONOXIDE. *G. Guillain, R. Thurel, and H. Desoille. Bull. et mém. Soc. méd. d. hôp., Jan. 26, 1931, vol. 47, p. 36.*

THE TREATMENT OF CARBON MONOXIDE POISONING BY LIGHT RAYS. *F. Koza. Abstr. as follows from Med. Klin., 1930, vol. 26, pp. 422–425, in Bull. Hyg., March, 1931, vol. 6, p. 233.*

This treatment is based on dissociating the carbon monoxide from the hemoglobin by ultraviolet rays combined with the administration of oxygen. In animals which have no hemoglobin, carbon monoxide has no more effect than nitrogen and Haldane kept cockroaches fourteen days in an atmosphere composed of 80 per cent. carbon monoxide and 20 per cent. oxygen without injuring them. It has been found that by increasing the atmospheric pressure so that oxygen is forced into the blood plasma, mice will stand quite well a deadly atmosphere of 50 per cent. carbon monoxide with 50 per cent. oxygen. Treatment of carbon monoxide poisoning by the inhalation of oxygen under pressure leads to an increased quantity of carbon dioxide in the expired air. Haldane has found that the combination of carbon monoxide and hemoglobin does not occur so quickly in bright light as in darkness, and Hartridge has been able to saturate hemoglobin with carbon monoxide up to 96 per cent. in darkness, compared with only 35 per cent. in sunlight. For the dissociation of carbon monoxide from hemoglobin, ultraviolet rays have been found more effective than sunlight. By means of Hartridge's special spectroscope the author determined the amount of carbon monoxide in the blood of rabbits poisoned with illuminating gas, and then testing again after the application of ultraviolet rays was able to notice the marked reduction of the carbon monoxide compared with the controls.

These experiments induced him to try ultraviolet rays in his clinic as a treatment for carbon monoxide poisoning and with very favorable results. He was fortunate in having a case he could observe in association with a control, as two sisters were brought for treatment, both of whom had been exposed in the same room for the same length of time to carbon monoxide from a charcoal stove. They came under treatment about ten minutes after they were found. They were both unconscious, with rigidity of the muscles of the body, especially of the upper limbs. With the spectroscope a rapid estimation of the amount of carbon monoxide was made and in one it was found to be 70 per cent. and in the other 68 per cent. Both patients were treated with inhalations of oxygen and injections of cardiac stimulants, and the patient with the 70 per cent. carbon monoxide was in addition treated with ultraviolet rays over the whole body, front and back, for twenty minutes and the skin was well rubbed with a dry hand to cause an erythema. After the ray treatment the strength of the carbon monoxide fell to 32 per cent., but with the other patient who did not receive this treatment the strength of the carbon monoxide was 54 per cent. one- and one-half hours after. The patient treated with the rays recovered consciousness eight hours after treatment commenced and the other not till seventeen hours afterwards.

The author emphasizes the importance of this new treatment being carried out in conjunction with the inhalation of oxygen.—A. J. C.

HEALTH HAZARDS IN CHROMIUM PLATING. *J. Blair. Abstr. as follows from Ohio State Med. Jour., Feb., 1931, vol. 27, p. 142, in Jour. Am. Med. Assn., March 28, 1931, vol. 96, p. 1102.*

Blair states that there is no evidence, from the literature or otherwise, that any injury arising from contact with chromic acid solution or spray in chromium plating develops into a constitutional disease. The ulceration and perforation of the nasal septum as well as the formation of chrome sores on other parts of the body are only local in their action; they are not in themselves of grave consequence and do not lead to permanent disability and are seldom severe enough to necessitate absence from work. With the recognition of the hazard, prevention and treatment should be easy.—C. K. D.

CHROME PLATING AND ITS OCCUPATIONAL RISKS. *Roels. Rev. du travail, 1931, vol. 32, pp. 116–128.*

The advantages obtained by chrome plating are stated as follows: exceptional hardness, and resistance to heat and to chemical agencies. The method followed in plating by electric baths is described briefly and clearly. Iron and steel articles are first coated with copper and nickel. In every case, if a polished surface is desired, the article to be plated must first be polished, as the coating of chrome is too hard to be polished after deposition. If the bath is worked at a temperature of from 20° to 25°C., a mat surface results; if it is worked from 35° to 38°C., a polished surface is obtained. When the bath is in action, oxygen and hydrogen are given off, and steps must be taken to prevent them from exploding. At the same time bubbles of gas carry up droplets of chromic acid from the bath. If these

are inhaled they attack the mucous membrane of the nose and injure the nasal septum, thus causing perforation. This process, however, gives rise to no trouble or inconvenience to the worker, who often is quite unaware that his nasal septum is perforated. If the chromic acid solution falls upon abraded skin of the hands, it attacks it by setting up painful and indolent ulcers or chrome holes, which differ in no way from chrome holes occurring in other occupations. These occupational troubles can be entirely prevented (1) by a suitably arranged exhaust draft placed over the electrolytic bath to draw away all gases as they are evolved, and (2) by the use of rubber gloves to keep any splashes from the bath off the skin of the attendant.—E. L. C.

Copper Content of Human Organs. *H. Kleinmann and J. Klinke. Abstr. as follows from Virchows Arch. f. path. Anat., 1930, vol. 275, p. 422, in Arch. Path., Feb., 1931, vol. 11, p. 303.*

The rôle ascribed by Mallory to chronic intoxication by copper in the etiology of hemochromatosis has led to the development of new methods for the quantitative estimation of minute amounts of copper in the tissues. The authors modified slightly the colorimetric method of Schönheimer and Oshima. They give in detail the technical procedure used by themselves. The average error of the method in control blank analysis was 1.7 per cent., and in control analyses of tissues to which known amounts of copper had been added the error was 3.6 to 6.8 per cent. Their results are tabulated as milligrams of copper per kilogram of dried substance in the case of organs examined and as milligrams of copper per liter in the case of blood. The copper content of twelve normal adult livers varied from 11.8 to 48.7 mg., with an average of 27.5 mg. These figures are slightly higher than those of Schönheimer and Oshima. Two samples of blood contained, respectively, 1.7 and 1.4 mg. of copper. A sample of cardiac muscle contained 2.2 mg., and one of skeletal muscle, but from another and younger person, contained 1.8 mg. of copper. The copper content of the liver in a typical case of hemochromatosis was 133 mg., a decided increase above the normal average. The liver in another case considered hemochromatosis, but with the pigmentary changes limited chiefly to the intestine, contained 18.3 mg. of copper. Two livers with nonpigmented cirrhosis contained, respectively, 8.7 and 3.9 mg. of copper. Of greatest interest are the relatively large amounts of copper found in the livers of fetuses and newborn infants. The copper content of ten such livers varied from 137.5 to 450 mg., with an average of 303 mg. The copper content of livers of three children, aged, respectively, 13 weeks, 14 months, and 2 years, varied from 12 to 26 mg. The thoroughly transfused liver of a newborn infant contained 516 mg. of copper, proving that the high copper content of the liver at this period of life is not due to the copper of the blood in the organ. The large amount of copper in the liver of the fetus and of the newborn infant is interpreted as evidence of the important functional rôle of this element in the normal physiology of the fetus and of the very young infant.

J. I. H.
Sept., 1931

DETERMINATION OF COPPER IN BIOLOGIC MATERIAL. *J. M. Inouye and F. B. Flinn. Jour. Lab. and Clin. Med., Oct., 1930, vol. 16, pp. 49–51.*

This is a review of several methods of estimating copper in biologic material. Details are given for the electrolytic precipitation of copper and its determination either by weight or by subsequent titration. The accuracy of the titration method is given as 0.02 mg.—L. T. F.

EXPERIMENTAL CIRRHOSIS OF THE LIVER CAUSED BY THE PRESENCE OF COPPER IN FOOD. *Andrianoff. Schweiz. med. Wchnschr., May 3, 1930, vol. 60, p. 421.*

DISEASES OF THE EYES CAUSED BY HYDROGEN SULPHIDE. *P. A. Jaensch. Abstr. as follows from Med. Klin., June 27, 1930, vol. 26, pp. 955–956, in Bull. Hyg., Feb., 1931, vol. 6, p. 141.*

The growth of the artificial silk industry has been accompanied by a large number of cases of eye disease among the workers; at a certain stage of the manufacture there is a process which gives rise to the appearance of quantities of hydrogen sulphide and carbon disulphide. The latter sinks to the ground, but the former mixes with the air and unless the ventilation is good, gives rise to troublesome symptoms. In the first instances, the disease was considered to be conjunctivitis, since the symptoms and signs pointed to this; but greater knowledge has shown that in most cases there is superficial punctate keratitis in the region of the palpebral fissure. This is often followed by the formation of vacuoles and bullae which occasion severe pain; the course of the disease explains the frequent history that the workman after leaving work is attacked by severe pain on his way home or even after he has been in bed for some hours. Until the vacuoles and bullae form there is little more than irritation felt.

This condition may always arise if the proportion of hydrogen sulphide rises above 0.5 per cent.; a smaller proportion will seriously affect a worker who has any corneal trouble; for this reason all who suffer from trachoma or corneal ulcer should be forbidden to enter this employment. The prognosis is good; the disease generally lasts only a few days; it is best relieved by a bandage over both eyes and by warm applications. Cocaine should be avoided and no mydriatic is ever necessary.—H. G.

POISONING BY SULPHURETTED HYDROGEN GAS IN A TANNERY. *Fritz. Abstr. as follows from Zentralbl. f. Gewerbehyg., July, 1930, N. S. vol. 7, pp. 191–193, in Bull. Hyg., Feb., 1931, vol. 6, p. 142.*

The author describes a catastrophe in which five workers lost their lives, and four others were rendered temporarily unconscious because of this gas. In the tannery in question, the hides were dehaired with sodium sulphide and the effluent was led into a vat in the basement, while into another vat in the same basement lime effluents were run. The sodium sulphide effluent amounted daily to 60 cu.m. As it had already given rise to trouble from sulphuretted hydrogen, it was mixed with the lime effluent and pumped into a steel container and treated with sulphuric acid. The sulphuretted hydrogen produced by this treatment of the sodium sulphide with

sulphuric acid was driven out of the effluent by compressed air and passed through filtering material into the air. After cessation of the formation of the gas in the container, the treated effluent was led into the vat which contained the effluent from liming, and was sent to the precipitation tanks.

The accident was apparently due to the fact that an excess of sulphuric acid was mixed with the sodium sulphide effluent. The first attendant who descended into the vat immediately became unconscious. A second attendant tried to pull him out and was himself rendered unconscious. The foreman partly pulled the second attendant out, and at his call further assistance came which enabled the foreman and the attendant whom he was holding to be drawn out. The rescuers then tried to reach the first attendant, and a further seven of them fell unconscious into the vat. Further effort was stopped in order to ventilate the room by breaking the windows and to set the compressor at work to move the air. When fresh air was admitted it was possible to save those who were unconscious, by means of hooks. Of the nine unconscious persons—for the foreman recovered quickly—four were brought round by artificial respiration and the remaining five died.

It is pointed out that 0.015 volume per cent. causes symptoms of poisoning and especially inflammatory effects on the mucous membrane, and that at 0.15 volume per cent. unconsciousness and death will result.—T. M. L.

ON POISONING BY ZAPON LACQUER. *G. Ohnesorge. Abstr. as follows from Deutsch. med. Wchnschr., 1930, vol. 56, pp. 961–963, in Bull. Hyg., Feb., 1931, vol. 6, p. 144.*

Zapon lacquers are solutions of nitrocellulose, celluloid, and the like, generally in solvents such as amyl acetate, acetone, and benzene. Occasionally chlorinated hydrocarbons of the aromatic series are used.

Few cases of actual poisoning have been reported although discomfort from headache, giddiness, cough, and throat irritation are common. The author describes three cases, all from the same factory, in which there was not only the reduction of erythrocytes to below 5,000,000 and increase of the leukocytes to over 7,000 per cubic millimeter, suggestive of benzene, but also the presence of symptoms indicative of affection of the liver. (The precise urinary changes are described.) The skin and the sclerotics particularly were jaundiced.

Analysis of the lacquer showed the presence of tetrachlorethane which has been responsible for much illness and not a few deaths (*e.g.*, in the doping of aeroplane wings during the War) from its specific action on the liver cells. Ohnesorge does not state what the actual percentage was. In aeroplane dope it varied from 5 to 12.5 per cent. —T. M. L.

THE DETECTION OF SMALL QUANTITIES OF LEAD IN THE TISSUES. *F. C. Wood. Jour. Cancer Res., Aug., 1930, vol. 14, pp. 476–485.*

Using the spectographic method the author found that lead was invariably present in all the organs, the blood, and the tumors of 60 to 100 gm. rats that had received an intravenous injection of 1 mg. of lead, in the form of either the Blair Bell colloid, the Ullmann colloidal phosphate, or organic preparation of lead of various types.—L. T. F.

TARRED STREETS AS CAUSE OF CANCER. *K. B. Lehmann. Abstr. as follows from Arch. f. Hyg., Sept., 1930, vol. 104, p. 105, in Jour. Am. Med. Assn., Dec. 20, 1930, vol. 95, p. 1950.*

In determinations of the tar content of the air raised from tarred streets by the passage of automobiles over them, Lehmann found that during an eight-hour ride approximately 10 meters behind an automobile on a tarred street only 1.5 mg. of tar passed off into the air. He believes that this amount is too small to make tarred streets a factor of any importance in the etiology of cancer either of the skin or of the lungs.

AN EARLY TAR CANCER OF THE RABBIT'S EAR WITH PENETRATION OF THE CANCER CELLS INTO THE BLOOD VESSELS. *A. Babes. Abstr. as follows from Bull. Assn. franç. pour l'étude du cancer, 1930, vol. 19, p. 162, in Arch. Path., Jan., 1931, vol. 11, p. 162.*

The internal surface of the ear of a female rabbit was painted with Roumanian tar, resulting in the appearance of a cancer within twenty days. The malignant disease was found on both sides of the painted ear. A biopsy revealed the presence of cancer in the circulation.

NEGATIVE EXPERIMENTAL OBSERVATIONS ON TAR CANCER. *U. Fabris. Abstr. as follows from Clin. chir., Oct., 1930, vol. 33, p. 1148, in Arch. Dermat. and Syph., April, 1931, vol. 23, pp. 745–746.*

Fabris, not having been able to produce tar cancer after numerous experiments on about 600 animals, holds that the prolonged irritating action of tar (coal tar, Norway tar) may prepare a terrain adapted to the development of blastomas in the sense of provoking an antiblastic dysfunctioning in the various tissues of the organism. For the final causation of the cancer some parasitic agent must become associated, which constitutes for Roncali and his "school" the true specific element in the appearance of the blastoma.

DUST HAZARDS AND THEIR EFFECTS

PNEUMONOCONIOSIS. *J. W. Flinn and R. S. Flinn. Abstr. as follows from Southwestern Med., 1930, vol. 14, pp. 327–329, in Bull. Hyg., March, 1931, vol. 6, p. 226.*

The dust inhaled and the susceptibility of the individual comprise the etiology of pneumonokonioses. Inorganic dusts, differing chemically from the body, are mainly at fault, the most harmful being crystalline silica. This material causes fibrosis by a chemical, rather than mechanical, reaction. The finer the dust, the more dangerous it is; and respirators do not catch the finest particles. Wherever silica dust occurs in industry, there exists a health hazard. Pulmonary fibrosis takes from six to twenty years to develop, according to the amount of fine silica present in the dust inhaled; it starts with a useless paroxysmal cough and dyspnea on exertion. Next the heart feels the strain with rapid pulse and increased blood pressure. Still the patient may enjoy good health. At any moment tuberculosis may supervene. Silicotic fibrosis gives characteristic snowstorm mottling seen by X-rays. Slowly produced pneumono-

koniosis renders the lungs less susceptible to the spread of tubercle bacilli. [Evidence in favor of this statement is not given.] Use of pneumatic tools, especially for granite cutting, has greatly accentuated the silica danger; the phthisis death rate has risen among Barre granite cutters from 1.5 per thousand in 1890 to 19.6 in 1924. Prevention lies in minimizing the dust hazard, and in periodic medical examinations with X-rays of those employed in silica industries. In Arizona copper mines water jets are used on the pneumatic drills; sprays saturate the incoming air; and good ventilation removes contaminated air.—E. L. C.

STUDIES IN PNEUMONOKONIOSIS IN ITALY. *G. Loriga and others. Istituto Poligrafico dello Stato Libreria. Pp. 139. Rome, 1930.*

This monograph deals with such investigations as have been carried out in Italy regarding injury caused in occupations due to dust inhalation. The first article is contributed by Professor Loriga, who states the position generally, and gives a bibliography including only Italian contributions to literature on the subject. The second article, by G. Bianchi, discusses the dust hazard among masons who manipulate marble. He points out that the tolerance exhibited by the lungs toward marble dust is extraordinary, having regard to the intensity of the exposure. Nevertheless, marble dust inhaled over a long period in laboratory experiments does provoke pathologic changes, with disseminated peribronchitis and interstitial pneumonia. Among the men at work, clinical symptoms and radiographic signs of injured lungs do not indicate the presence of a definite occupational hazard. A radiographic study of the lungs of operatives employed on Carrara marble is contributed by Dr. Turano, who attributes the comparative harmlessness of calcium dusts, such as marble, to their easy solubility in the lung tissues; whenever there is any amount of silica present in the stone, the lungs may show signs of fibrosis. No special disposition to tuberculosis, however, could be demonstrated among the masons.

The last two articles deal with the question of asbestosis; the first is by Dr. Lovisetto. He finds that the inhalation of asbestos dust may originate fibrosis after about five years. The condition so determined may advance to a fatal issue without the intervention of any superimposed infection, such as tuberculosis. In fact, asbestosis is an occupational disease, not infectious and not contagious; while slow in onset, it is progressive, and the process of developing fibrosis cannot be arrested. The measures which should be adopted to prevent the hazard, such as diminution of dust and medical supervision of the workers, are set out. Dr. Mussa adds some notes on X-ray examinations. A series of well-produced radiographs appear to illustrate the articles dealing with asbestosis.—E. L. C.

EXPERIMENTAL DUST INHALATION IN GUINEA-PIGS. *F. Haynes. Jour. Hyg., Jan., 1931, vol. 31, pp. 96–123.*

The results obtained by a long series of animal experiments with dust are reported. First, an historical résumé is presented of previous experimental work, which indicated that a distinc-

tion can be drawn between the effects produced on the lungs of guinea-pigs by different dusts. Groups of healthy guinea-pigs received two hours' dusting per week day for a fortnight; the animals were killed at varying periods after the last exposure. Control animals were kept under the same hutch conditions. Different groups were exposed to dusts of (1) flint and shale, (2) china clay (3) flint, (4) slate, (5) pure precipitated silica, (6) hematite, (7) carborundum, (8) wood charcoal, (9) precipitated chalk, (10) aluminium hydroxide, (11) calcspar, (12) emery, (13) mixed aluminium hydroxide and precipitated silica, (14) light magnesium carbonate, (15) one part of precipitated silica to three parts of light magnesium carbonate, (16) talc, (17) colloidal coal, and (18) shale.

The experiment showed that fibrosis may be caused by many apparently innocent dusts, that is, dusts the inhalation of which in man is not followed by increased mortality from pulmonary disease. But any correlation between the fibrosis caused and liability to tuberculosis is lacking in the experiments. The most deadly of all dusts examined was precipitated silica, after which, in order of decreasing toxicity, came flint, slate, aluminium hydroxide, precipitated chalk, magnesium carbonate, and carborundum; calcspar and emery were borderline dusts. Colloidal coal in massive amounts was potentially dangerous, and so was shale. Hematite, talc, and molecular mixtures of soluble silica with aluminium hydroxide and magnesium carbonate, respectively, were not found to cause any permanent lesions in the lung. All inhaled particles become rapidly ingested by phagocytes, until the cells have taken up a saturated load. Such cells either migrate into the lymphatics, or move on into the air passages to be coughed out. Dust cells may be arrested in the lymphatics, in this way obstructing other cells; they degenerate, and liberate their dust which leads to fibrosis through irritation. Most particles contain some soluble matter, either harmlessly active or toxic. If toxic, the viability of the phagocyte, and also the neighboring tissues, is affected. The predisposition to tuberculosis set up by silica dust is due to its influence in forming a medium suitable not only for the survival, but for the proliferation of the tubercle bacillus in the lung. The harmful effect of soluble silica may be neutralized by simultaneous administration of basic dusts, such as aluminium hydroxide or magnesium carbonate, though the latter are themselves harmful when inhaled alone. It is suggested that their respective solutes combine to form monosilicate, which does not appear to be harmful to the lung. Heavy inhalations of any dust are liable to cause pulmonary damage; but the intensity of the initial reaction to any dust is in inverse ratio to the degree of eventual damage caused.—E. L. C.

THE ORIGIN FROM THE BLOOD OF PIGMENT IN STAINED, SO-CALLED "ANTHRACOTIC" SPUTUM. *J. Paviot, R. Chevallier, and H. Badinand. Méd. du travail, Jan., 1931, vol. 3, pp. 28–33.*

Sputum was collected from a number of subjects who were not exposed occupationally to the inhalation of dust from coal or metals. When the sputum was surcharged with dust, it was found to be composed almost exclu-

sively of iron pigment. A similar condition was found in the sputum from cases some time after hemoptysis, when all obvious traces of blood had disappeared. The opinion is advanced that the black pigment in sputum has an endogenous origin. Examination of the red cells in such cases exhibited an increased fragility, the amount of which was in proportion to the amount of iron pigment present in the expectoration. The authors point out that the evidence which they advance of the origin of pigmentation should be considered when sputum from those exposed occupationally to the inhalation of metallic dust is being examined. (Since, however, the dust of iron has no pathologic significance, the observations made seem to be of only theoretical interest.)—E. L. C.

Chemical Examination of Black Lungs and Viscera from a Man Who Had Worked for Five Years in a Lead Mine. *J. Paviot, R. Chevallier, and H. Badinand. Méd. du travail, Jan., 1931, vol. 3, pp. 19–27.*

The cause of death in this case was pulmonary tuberculosis, the progress of which had been intensified by alcoholic habits. The two lungs were black or anthracotic, containing a certain amount of fibrous tissue, but no more than might have resulted from the chronic tuberculous condition present. No lead was found in the lungs or spleen, but there was some in the liver. The main point to which attention was directed concerned the origin of the black coloration. This is ascribed to iron rather than to carbon, and the opinion is expressed that the iron originated from red corpuscles, the fragility of which was high. The proportion of iron present in the liver or spleen was much less than that found in the lungs. The object of the paper is to claim that pigment in anthracotic lungs may be due to iron and may originate endogenously.—E. L. C.

Pneumonoconiosis in Iron Miners. *G. B. Lawson, W. P. Jackson, and J. E. Gardner. Jour. Am. Med. Assn., April 4, 1931, vol. 96, pp. 1129–1131.*

1. Operators of air drills, working four or five years in an atmosphere heavily laden with iron ore and silica dust, may develop distressing symptoms of lung fibrosis after they have discontinued mining and have lived from four to eight years in apparently good physical and hygienic conditions.

2. The fact that such operators at the time of their retirement from years of exposure to iron and silica dust have no symptoms may have but little bearing on the future progress of their disease.

3. This form of lung fibrosis is not merely a cumulative action of dust but is a result, a stage of the disease which requires for its development a certain amount of time after the heavy inhalation of dust.

4. This marked secondary fibrosis is comparatively rapid in its development.—*Authors' Conclusions.*

Pulmonary Silicosis. *A. Feil. Abstr. as follows from Presse méd., Sept. 10, 1930, vol. 38, pp. 1220–1223, in Bull. Hyg., March, 1931, vol. 6, p. 227.*

This article sets out clearly and fairly present knowledge with regard to pulmonary silicosis. The way in which fine particles of free silica, when carried by macrophage cells from the

alveoli into the lungs, dissolve there and act as a tissue poison, is explained. A fibrous reaction to the poison follows, and nodules form which can be detected by X-rays. The silicotic reaction is essentially a lymphatic fibrosis. One or more cells loaded with dust obstruct the lymph flow, when other cells collect against them and so increase the block. A characteristic, specific to this type of fibrosis, is a tendency to succumb to tuberculous infection, which proves fatal in the majority of these cases. The dust particles must be small, from 0.5 to 5 microns. The greater the amount of dust, the greater is the risk, which is also increased by the length of exposure to risk. Nevertheless, some other dusts, when mixed with silica particles, appear to interfere with their poisonous properties, while others, *per contra*, may facilitate toxic reaction. There are, then, two conditions: simple silicosis and silicosis combined with tuberculosis. The former takes years to develop, and manifests its presence by dry cough and dyspnea on exertion; but the patient may otherwise be apparently healthy; nevertheless, advanced cases, due to cardiac failure, may terminate fatally. More usually tuberculous infection supervenes at some stage, whereupon the picture rapidly alters for the worse, and degeneration occurs, with or without a febrile state, hemoptysis, and night sweats. Simple uncomplicated silicosis does not pass away; it rather tends slowly to develop, but prognosis is fair until an infection supervenes. Diagnosis is not always easy; it is aided by X-ray examination, but shadows are thrown by lungs damaged by other dusts, which often are difficult to distinguish from those of silicosis. Knowledge of the occupation of the man is of great assistance. The suggestion has been made that all silicosis is sooner or later associated with tuberculous infection. Undoubtedly silica plays an essential part in the pathology of occupational pneumonokonioses, and supplants the place which used to be given to anthracosis. [This article is an excellent summary, which will, however, be of more value to continental than to English speaking readers. The author recognizes throughout that today knowledge regarding silicosis depends upon the work done by British investigators.]—E. L. C.

SILICOSIS IN THE RUHR DISTRICT. *A. Böhme and C. Lucanus. Abstr. as follows from Schrift. a. d. Gesamtgeb. d. Gewerbehyg., N. S. no. 33, 1930, pp. 147, in Bull. Hyg., March, 1931, vol. 6, pp. 227–228.*

Professor Böhme has probably greater clinical knowledge of silicosis than anyone else in Germany. The great value of this publication is that he deals with 132 cases which have been kept under observation for years in the wards in the Bochum Hospital. As he deals especially with the stone cutters and drifters of the Ruhr coal field, it ought to be of the utmost value to those who are working at the same subject, *e.g.*, in South Wales.

He takes up the cases systematically and for each one he gives: (1) the age; (2) the duration of employment in years, both in coal and in stone; (3) the previous history; (4) the clinical findings; (5) the appearance of the X-ray findings at the first examination and the same at any later examination. All this is arranged in tabular form, thus

making it extremely easy to follow. Accompanying it is a critical detailed examination with a very large number of excellent X-ray photographs of the conditions found. His first group is that of miners with clinical appearances of very early dust induration; he follows this up with stone cutters, with finely stippled dust induration; next come stone cutters with nodular dust induration, and to this group the greatest space is devoted.

His clinical observations have led him to the following general conclusions: Twenty-two per cent. of those with very slight changes when they first came under observation showed within the observation time an increase in the fibrotic process. In a few years this can become a marked nodular condition; small tuberculous lesions can produce appearances not to be distinguished from silicosis, except by animal experiment.

Of the cases with typical finely stippled silicosis, an increase of the fibrotic condition showed itself in 40 per cent. This process, however, advances more rapidly in those who continue working than in those who give up work, but even among the latter it can advance rapidly. A considerable number of this class are early affected with tuberculosis, showing itself generally in apical and subapical thickenings.

Of the cases in this third group (diffuse silicosis with development of massive shadows), the great majority advanced and many resulted in death during the observation period; this process continues for many years after work has ceased. When complicated with tuberculosis, death ensues in a few years.

In the main, he states his agreement with the findings of South African investigators. [Dr. Böhme was one of the two German delegates to the Johannesburg Conference held last August, contributing the paper on "Silicosis in Germany."]—T. M. L.

REPORT ON THE INTERNATIONAL CONFERENCE ON SILICOSIS HELD AT JOHANNESBURG IN AUGUST, 1930. *E. L. Middleton. H. M. Stationery Office, 1931, pp. 19.*

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

PNEUMONIA IN NATIVE MINE WORKERS OF WITWATERSRAND GOLDFIELDS: BACTERIOLOGIC AND EPIDEMIOLOGIC STUDY. *D. Ordman. Abstr. as follows from So. Africa Med. Assn. Jour., Feb. 28, 1931, vol. 5, p. 108, in Jour. Am. Med. Assn., May 30, 1931, vol. 96, p. 1915.*

The history of lobar pneumonia among the native mine workers of the Witwatersrand gold mines is traced by Ordman from 1907 until the present. A chart is shown illustrating the fall in the mortality rates that occurred in this disease up to 1927 and a slight rise again from that year. It is concluded from clinical, immunologic, and bacteriologic evidence that a modified form of the one-time classic lobar pneumonia occurs frequently now. In this type of case there is a varied bacterial flora with or without the pneumococcus, and against this form the polyvalent pneumococcal vaccine is to a

large extent ineffective. The seasonal influence on the incidence and mortality rates in pneumonia is discussed. Two peaks of high mortality rates are described, one in the winter and one in the spring. There is evidence that the bacterial flora of the winter pneumonia differs from that in the spring. Differences in the pneumonia mortality rates are shown to occur in the different mining communities in the Witwatersrand area over the same period of time. The continuous change in the strain of the pneumococcus responsible for infection is described. The need for periodically altering the bacterial elements of the prophylactic vaccine against pneumonia, coincident with the discovery of new strains of the pneumococcus or with the isolation of other organisms in the disease, is emphasized. The bacterial flora is different in cases of pneumonia occurring in different parts of the Witwatersrand. A plea is made for the preparation and use of a "community autogenous vaccine" containing the specific microorganisms recovered from the geographically different communities. The active co-operation of the clinician dealing with cases of lobar pneumonia and the laboratory is shown to be essential in order to obtain an intelligent understanding of the epidemiology of the disease, and so to maintain the prophylactic vaccine at a uniformly high level of usefulness.—C. K. D.

THE EFFECT OF IRRADIATION WITH ULTRA-VIOLET LIGHT ON THE FREQUENCY OF ATTACKS OF UPPER RESPIRATORY DISEASE (COMMON COLDS). *J. A. Doull, M. Hardy, J. H. Clark, and N. B. Herman. Am. Jour. Hyg., March, 1931, vol. 13, pp. 460–477.*

Irradiation of a large group of adults with ultraviolet rays over a period of thirty-five weeks showed a total higher incidence of colds in the irradiated group than in a similar non-irradiated group over the same period.—L. T. F.

THE RESULTS OF ARTIFICIAL PNEUMOTHORAX TREATMENT OF MANUAL WORKERS AND ITS IMPORTANCE IN THE CURE OF TUBERCULOSIS. *O. Neuburger. Abstr. from Ztschr. f. Tuberk., 1930, vol. 57, pp. 232–240, in Bull. Hyg., March, 1931, vol. 6, p. 254.*

Between 1925 and 1928, an artificial pneumothorax was induced in eighty-six patients, 90.7 per cent. of whom had active phthisis. During their treatment in the sanatorium 41.9 per cent. ceased to be positive. Of 307 patients in 1927 not treated with artificial pneumothorax only 18.9 per cent. ceased to be positive. The mean duration of treatment of the pneumothorax patients in the sanatorium was 4.7 months. Of the pneumothorax patients, 80.2 per cent. became capable of work; of 363 other patients in the same stages of the disease only 59.8 per cent. became capable of work.

Even one to five years after discharge the pneumothorax patients show as high a percentage (about 60 per cent.) capable of work as do the other patients at actual time of discharge.

Only 3 per cent. of the patients during 1925 to 1928 were treated by this method (partly owing to the opposition of patients and partly owing to somewhat severe criteria of selection of suitable cases) but these favorable results make it hopeful that it can be further extended.—A. B. H.

COAL DUST IN THE TREATMENT OF PULMONARY TUBERCULOSIS. *W. Glaser. Abstr. as follows from Beitr. z. Klin. d. Tuberk., Dec. 22, 1930, vol. 76, p. 187, in Jour. Am. Med. Assn., April 11, 1931, vol. 96, p. 1271.*

Glaser described nineteen cases of pulmonary tuberculosis in which he used treatment with a coal dust preparation. A dose of 3 c.c. was injected intravenously; the injection was repeated after a ten-day interval. No more than three injections were given. After each injection the patient was kept in bed for three days, and the temperature was taken every two hours. The injections caused a pleuritic irritation in one patient and a bloody expectoration in another. In one instance the treatment was followed by a rapid subsidence of fever; usually the subfebrile temperature persisted or even developed afterward. The sedimentation speed of the erythrocytes sometimes became reduced or remained unchanged; the general condition improved. The injections proved to be most efficient in patients with catarrhal lesions, but the effect was transient. Remarkable improvement was observed in a case of ulcerous productivocirrhotic tuberculosis after two injections. The author points out that the action of intravenous injections proved to be different from that caused by the inhalation of carbon dust by miners.—C. K. D.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

REPORT ON DESENSITIZING EXPERIMENTS IN OCCUPATIONAL DISEASES OF THE SKIN. *B. Hajos. Abstr. from Dermat. Wchnschr., 1930, vol. 91, pp. 1340–1344, in Bull. Hyg., Feb., 1931, vol. 6, p. 140.*

The author accepts the view that the substances used in industry are not the only factors to be considered in the causation of industrial eczema, but that the nature of the patient's skin is equally, if not more, responsible. Thus a painter would not succumb to turpentine, were not his skin hypersensitive to the substance; that is, there exists in the skin antibodies to turpentine which, when they encounter the antigens, give rise to the reaction—eczema. He would like to see skin tests of workpeople made in order to determine whether or not there is an allergy toward the irritating substances. This would have the double advantage of lessening incidence and directing to other branches of industry persons who reacted.

He cites work done successfully in this direction by Geiger and in his own clinic, employing Jadassohn's and Bloch's methods and test. He describes eight cases. The procedure is tedious and requires much patience both on the part of the physicians and on the part of patients, but in his opinion results justified further trial of the method.—T. M. L.

NICKEL DERMATITIS: A NEW SOURCE. *E. S. Lain. Jour. Am. Med. Assn., March 7, 1931, vol. 96, pp. 771–772.*

1. Nickel dermatitis is probably more common outside of nickel plating works and the professional laboratories than textbooks and medical literature would lead one to infer.

2. Three cases due to new white gold spectacle frames were observed within the same season.

3. In modern times when so much jewelry and so many spectacle frames are made of white gold, an alloy containing nickel, it is necessary to consider this possible etiology in eruptions occurring on areas of the body in contact with such metals.—*Author's Conclusion.*

NICKEL DERMATITIS. *C. Du Bois. Schweiz. med. Wchnschr., March 21, 1931, vol. 61, pp. 278–280.*

The occurrence is reported from Geneva of a nickel itch which progresses to a troublesome dermatitis among men employed at large installations for nickel plating. Sooner or later nearly all employed are affected. The plating is done in large vats containing nickel sulphate 35 per cent., magnesium sulphate 18 per cent., and 1 to 2 per cent. of sulphuric acid; the baths are worked night and day at 85°C. A dense vapor arises obscuring vision for more than a yard; it impregnates the overalls. The itch starts where the damp overalls rub the skin; but once started the dermatitis may spread. Men who sweat are easily affected, and more cases occur in warm weather. Out of 370 men employed in 1928 and 1929, only 5 per cent. escaped. On the other hand, at small factories where plating is done cold, no cases could be traced. Steps are being taken to reduce condensation of vapor by using hot air. For treatment, lanolin on the skin is of value and so is careful washing; most cases recover on cessation of work, but some are difficult to cure. One attack predisposes to a second; alcoholism also predisposes. The distinguishing feature of the condition is the intense irritation on commencement.—E. L. C.

SKIN INFECTIONS IN A METAL WORKING PLANT. *A. E. Fredenberg. Wisconsin Med. Jour., Oct., 1930, vol. 29, p. 562.*

This is a report on an outbreak of skin irritations and wound infections among machine shop operatives of the Four Wheel Drive Auto Company, Clintonville, Wis. Analyses of oil samples from the machines showed high bacterial counts, whereas specimens of new oils were found to be practically sterile. It was discovered that the men were expectorating against the walls or directly into the oils, and were throwing particles of food, tobacco quids, and so forth into the oil containers. Measures taken to remedy the situation were: painting the walls and passageways; providing individual sawdust boxes; sending a personal letter to each workman; and adding a disinfectant to the oils. Hospital records for the six months following institution of these measures showed not a single case of dermatosis.

OCCUPATIONAL NYSTAGMUS IN TRAIN DISPATCHERS. *C. P. McCord. Jour. Am. Med. Assn., April 4, 1931, vol. 96, pp. 1131–1134.*

Among the 121 train dispatchers examined, in widely separated sections of the country, and from seventeen railroads, occupational nystagmus has been detected, involving eighty-one individuals, or 67 per cent. In addition, in two cities, among thirty persons examined, twenty-two, or 70 per cent., presented this condition.

The nystagmus found was essen-

tially all horizontal, with marked variation in the rate of motion, and with some variation in the rates for the two eyes.

This train dispatchers' nystagmus appears to be unassociated with aural conditions, although occupational deafness of 56.2 per cent. has been noted, which is more commonly present in the left ear, on account of the wearing of the hearing mechanism on that ear. It is believed that the noises common to train dispatching are responsible for the occupational deafness.

The nystagmus encountered among train dispatchers is accepted as occupational in origin and is attributed to the continual motion of the large paper train sheet beneath the eyes, and the movement of the head and eyes over the train sheet, both necessary in the continual recording of data concerning train movement.

It is maintained that the high frequency of the use of eyes in connection with train sheet work leads to overworking of the ocular mechanism, resulting in a nervous syndrome characterized by nystagmus, blepharospasm, some visual impairment, and ocular discomfort.

This occupational nystagmus of train dispatchers is less severe than the average cases of miners' nystagmus, and no case has been encountered that in itself was to be accepted as the cause of total disability.—*Author's Summary.*

MINERS' NYSTAGMUS, ITS SOCIAL IMPORTANCE, CAUSES, INCIDENCE, AND SYMPTOMS. *M. Bartels and W. Knepper. Schrift. a. d. Gesamtgeb. d. Gewerbehyg., N. S. no. 31, 1930.*

This is a most interesting contribution to the literature on nystagmus as it publishes the results of underground clinical examinations. The outstanding conclusion is that inadequate illumination is the main cause of the disease. Curves showing the incidence of nystagmus in Germany and England are given, but in reading these it has to be borne in mind that the legal standard of diagnosis in the two countries differs. In England it may be diagnosed even without the presence of oscillation of the eyeball (which in Professor Bartels' opinion is illogical), whereas in Germany the eye specialists of the Miners' Association (*Knappschaftskasse*), on whose findings the figures are based, require more evidence before certifying disability—*viz.*:

1. Capability for work is in the main judged to be present when in artificial or diminished light nystagmus fails to be induced with the eyes at the horizontal level and looking at a distance. Capability for work is also inferred if nystagmus is induced by looking upward but disappears immediately when the eyes are directed horizontally.

2. In the borderline cases the preceding rule cannot always be strictly adhered to but must be left to the conscientious estimate of the certifying physician, and the capability for work must be judged by his observation and knowledge of the patient. In such cases the physician enters his reasons why he does not consider (1) decisive.

3. If incapability for actual mining operations or equivalent labor underground is held to be established under (1) or (2), the unfitness for work is accepted absolutely even though the nystagmus patient may be able to carry out similar work above ground.

Dr. Bartels and Dr. Knepper consider that this standard for diagnosis gives grounds for controversy, as will

be shown later. In both Germany and England many more cases exist than become certified. An interesting graph gives comparative absolute figures of number of employed and cases of nystagmus in Germany and England.

Affected areas have not been mapped out in Germany, but there, as in England, the incidence varies in different districts. There are fewer cases in Silesia than in the Ruhr and Rhine areas. While hardly any cases are reported from some pits in Silesia, a considerable number come from others. Is this due to differences in pit conditions, or are other influences at work? Is the alleged scarcity of nystagmus in Russia and America a fact, or is it that the miners there do not report when sick?

It is shown, as is universally recognized in England also, that there is a relationship between the number of cases and economic conditions. To determine the true incidence, further extensive medical investigation underground must be made; and the doctor so engaged must be familiar with the conditions of work underground and must carry out the inspections at the men's place of work. Clinical examination above ground is not enough.

TABLE 1.—COMPARISON OF CONDITIONS IN MINISTER STEIN AND LANGENBRAHM MINES

CONDITIONS	MINISTER STEIN	LANGENBRAHM
Coal	Bituminous.	Anthracite.
Gas content	Up to 28%.	8–10%.
Depth	380 m.	345 in. (working place).
CH_4	0.05–0.28%	0.00–0.05%.
CO_2	0.08–0.24%.	0.30–0.40%.
Fire damp	Liable to be present.	No.
Stone dusting	Yes.	No.
Temperature in seam	15°–21°C.	16°–23°C. (in haulage roads).
Temperature at face	16°C.	12°–16°C.
Machine work	80%.	80%.
Thickness of seam	0.8–1.8 m.	0.4–1.0 m.
Distance inbye	0.8–2.4 km.	0.5–1.5 km.
No. of men underground	3,493.	1,011.
No. of men examined	1,076 (30.80%).	584 (57.76%).
Shift	$6\frac{1}{4}$ hrs.	6 hrs.
Lighting	Electric hand lamps since 1922; fixed electric lights (from a cable), 1926. Weight of electric hand lamp 4.2 kg.	Benzine oil lamps; fixed cable lamps used at hard headings.

A feature of the report is the very careful examination of men below ground, carried out by the writers in pursuance of this belief. So strenuous was this part of the investigation that one of the doctors broke down in health and was unable to complete the inquiry.

In this examination below ground, conditions in the mine, such as temperature at the working place, type of

coal, type of work, and thickness of the seam, were observed; and a clinical history was taken which included information regarding the following: previous illness; military service; nationality; years of working underground; method of work; soundness of sight and hearing; heredity; consumption of alcohol and tobacco; methods of lighting used; and present complaints.

The miner was then examined, if possible, kneeling or sitting down, with all nearby lamps extinguished excepting his own. The head and upper part of the body were kept upright, and the pupil and external eye were examined by the ophthalmoscope. Then with the aid of a magnifying glass, nystagmus was sought for in all directions, and the positions of its occurrence were carefully noted.

Two mines were chosen for their differing conditions—namely, the Minister Stein and the Langenbrahm Mines. (See Table 1.)

From the Minister Stein Mine, where the seams were thick and the lighting was good, 1,076 men were examined underground between June 1 and July 31, 1929, in a most thorough and detailed manner. Fifty-seven, or 5.29 per cent., of the men were found to have nystagmus. Table 2 shows the distribution of these cases of nystagmus according to occupation. Of the fifty-seven who, on examination underground, were found to have nystagmus, fifty-five were closely examined above ground at the Dortmund clinic. Thirty-four of this number showed oscillation immediately, thirty-eight after two hours in a dark room, and forty-eight after manipulation (shaking and stooping forward and backward several times, lifting weights, pressure on abdomen, etc.); seven showed no oscillations at all. It is important to note that there are a number of men who had definite nystagmus below ground, but showed no trace of it above ground. The shortest time that any man had worked was seven years; fifteen had worked from twenty-six to thirty years; nine had worked thirty years or over. (Ohm had a case after two and three-fourths years of work.)

TABLE 2.—DISTRIBUTION OF CASES OF NYSTAGMUS ACCORDING TO OCCUPATION

OCCUPATION	NO. OF MEN	CASES OF NYSTAGMUS	
		No.	%
Minister Stein Mine			
Coal hewers	517	40	7.73
Apprentices (*Lehrhauer*)	178	1	0.56
Repairers	78	15	19.23
Laborers, etc.	31	1	3.22
Officials	16	0	0.00
Hauliers	173	0	0.00
Langenbrahm Mine			
Coal hewers	358	48	13.40
Apprentices (*Lehrhauer*)	75	2	2.66
Repairers	13	2	15.38
Hauliers	79	1	1.26

From the Langenbrahm Mine in Essen-Rüttenscheid, where the seams are narrow and inclined, and benzine lamps are used, 584 were examined underground; of these, fifty-three, or 9.08 per cent., had oscillation. Thirteen of the fifty-three were quite unaware of the condition. The distribution of cases according to occupation is shown in Table 2.

Owing to the breakdown of one of the doctors (as mentioned before) only

twelve men were examined above ground.

The shortest time any miner had worked was three and three-quarters years (an apprentice—*Lehrhauer*). Thirty-eight stone workers were examined, all of whom had worked fifteen years or more underground, and not a single case of nystagmus was found.

The number of miners who gave evidence of oscillation *in all directions of the eye* was three times as great in the Langenbrahm Mine as it was in the Minister Stein. One of the most difficult problems in nystagmus is to judge the normality of vision, as this has to depend on the miner's own statement. Neither can the diminution in sight be judged by the degree of oscillation (although Ohm holds that it can).

Nystagmus does not in itself tend to produce diminished vision, and a considerable number of men affected have normal sight. It is not yet known what conditions markedly interfere with sight in some cases, while in other cases it is hardly affected. The authors mention the case of one patient who showed oscillation in the daylight with the eye directed upward, horizontally, and sideways, and whose vision in the sitting posture was practically normal, but standing was only one-quarter of the normal. This proves that very slight exertion can produce very marked differences.

In brief, it was found that in the Minister Stein Mine with electric light and wide seams the percentage is 5.2, while in the Langenbrahm Mine with benzine oil lamps and narrow and inclined seams the percentage is 10.7. In both mines the coal hewers formed the greatest number of cases (not percentage). These were followed by repairers and rippers (see Table 2).

The authors do not think that machine methods are to be blamed for nystagmus. This opinion is borne out by the fact that among thirty-eight stone workers examined underground, all of whom had worked for over fifteen years, no case of nystagmus was found. They worked in a standing position with electric hand or cable lamps, and stone absorbs much less light than coal. The better lighting and the different position of the body prevents the advent of nystagmus in spite of the strong vibrations caused by the drills.

About 90 per cent. of the men with nystagmus had no, or scarcely any, subjective symptoms, and thirteen were found who were quite unaware that they had the complaint. The subjective symptoms are frequently in no relationship to the objective symptoms. This often leads to difficulty—*i.e.*, in stopping workers who can work in spite of the complaint, and wrongly refraining from certifying those who ought to be certified.

Voluntary oscillation cannot be produced by a miner who has never had nystagmus, but a man who has once had it may be able to reproduce it by manipulation (*e.g.*, head shaking, bending forward repeatedly, etc.). It may also be brought out by the doctor himself in this way. There are also cases in which oscillation can be suppressed at will. Dr. Hofmann, contrary to the views of Ohm, states that this can be done by looking at a near object as well as by looking at a distance. Dr. Bartels quotes one case of a miner with marked rotatory nystagmus, who, when asked, could stop the oscillation by looking into the distance.

The various manipulative means by which the writers were able to induce nystagmus included head shaking,

bending backward and forward from ten to twenty times, compressing the abdomen, lying face downward, lying on the side, compressing both jugular veins, and lifting a heavy weight. They explain this as being due physiologically to an increase in the pressure of the spinal fluid; but which part of the central nervous system is stimulated by the rise in pressure is not yet known—possibly Deiters' nucleus (Ohm), possibly the neighborhood of the midbrain, or perhaps the corpus striatum.

Manipulations by which the nystagmus can be evoked again affect these centers through rise in pressure of the spinal fluid. It is, of course, only the will to bend, compress, etc., which is voluntary; the further course, and the frequency and the type of the oscillations are involuntary.

Turning to the consideration of the root cause of nystagmus, the authors state this to be defective lighting underground, and in this view they have the support of Llewellyn and Haldane in England, Benoit and Stassen in Belgium, and Ohm in Germany. For this reason every effort should be made to improve lighting, not only in pits where there is fire damp but in all pits. The lamp they approve of is the Concordia-Elektrizitäts (A. G. Dortmund), which gives an even distribution of light with hardly any visible shadow formation.

In addition to these main causes, there are minor contributing influences, such as positions of the head and body, a natural predisposition, alterations in blood and spinal fluid pressure and atmospheric pressure; and differences in depth, temperature, moisture, and so on. The writers do not share the view that prolonged upward directing of the eyes is a cause; neither do they consider as proven either Robson's theory of bacteria in coal or Ohm's theory of irritation of the organs of equilibrium. They do not deny that the prolonged inhalation of small quantities of gas might produce chronic poisoning.

For treatment they advise a stay above ground and cessation of work in the pit. There are cases, however, in which a change of pit may produce improvement, and some of the less severe cases of oscillation in one direction only, *e.g.*, above, may be cured by a change of working place underground. Similarly, adoption of different bodily postures at work may effect an improvement. Working on the theory that a rise in barometric pressure increases the spinal fluid pressure, it is suggested that men suffering from nystagmus should not be put to work in the deeper parts of the pit (see, however, in this connection the first report of the Miners' Nystagmus Committee, p. 28). Above all, they stress the need for improved lighting. Finally emphasis is placed on the need for more and more research, especially through systematic underground clinical examination, followed by a clinical examination above ground.—S. W. F.

THE NONMAGNETIZABLE METALLIC FOREIGN BODIES OF THE CORNEA, WITH THE REPORT OF A CASE. *B. W. Rycroft. Abstr. as follows from Brit. Jour. Ophth., Oct., 1930, vol. 14, p. 501, in Am. Jour. Ophth., Jan., 1931, vol. 14, pp. 89–90.*

This is a discussion of the various types of nonmagnetizable metal, such

as brass, copper, lead, solder, and gold, and the nature of the corneal injury sustained. The condition in which they exist in the cornea, namely, single or multiple, determines the method of treatment; removal by spud, anticipation of secondary ulceration, burning them out with the galvanocautery, curettage, suction, epithelial exfoliation or, if tolerated in the cornea, allowed to remain.

A case report follows in which a patient's corneas were studded with innumerable fine globules of silver solder. Photophobia was an outstanding symptom; boric lavage, atropine, and dark glasses were of small value. After two weeks' trial the corneas were well cocainized and an attempt was made to exfoliate the epithelium with a cotton probe. It was necessary to resort to the use of a discission needle, before all parts of the corneal epithelium were removed. Few of the foreign bodies came away. Vision was 6/9.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

TESTS ON VITAL CAPACITY. *F. H. Lorentz. Arch. f. Hyg., Sept., 1930, vol. 104, pp. 378–385.*

Tests of vital capacity by the spirometer method, and by measurements of the size and expansion of the chest circumference, or chest depth, showed that the former method was the more reliable and was satisfactory for all practical purposes.—C. P. Y.

STUDIES ON THE MECHANISM OF WATER EXCHANGE IN THE ANIMAL ORGANISM. I. THE NATURE AND EFFECTS OF SUPERFICIAL BURNS. *F. P. Underhill, R. Kapsinow, and M. E. Fisk. Am. Jour. Physiol., 1930, vol. 95, pp. 302–314.*

Idem. II. CHANGES IN CAPILLARY PERMEABILITY INDUCED BY A SUPERFICIAL BURN. *F. P. Underhill, R. Kapsinow, and M. E. Fisk. Ibid., pp. 315–324.*

Idem. III. THE EXTENT OF EDEMA FLUID FORMATION INDUCED BY A SUPERFICIAL BURN. *F. P. Underhill, M. E. Fisk, and R. Kapsinow. Ibid., pp. 325–329.*

Idem. IV. THE COMPOSITION OF EDEMA FLUID RESULTING FROM A SUPERFICIAL BURN. *F. P. Underhill and M. E. Fisk. Ibid., pp. 330–333.*

Idem. V. THE RELATIONSHIP OF THE BLOOD CHLORIDES TO THE CHLORIDES OF EDEMA FLUID PRODUCED BY A SUPERFICIAL BURN. *F. P. Underhill, M. E. Fisk, and R. Kapsinow. Ibid., pp. 334–338.*

Idem. VI. THE COMPOSITION OF TISSUES UNDER THE INFLUENCE OF A SUPERFICIAL BURN. *F. P. Underhill, M. E. Fisk, and R. Kapsinow. Ibid., pp. 339–347.*

Idem. VII. AN INVESTIGATION OF DEHYDRATION PRODUCED BY VARIOUS MEANS. *F. P. Underhill and M. E. Fisk. Ibid., pp. 348–363.*

Idem. VIII. A STUDY OF DEHYDRATION BY PILOCARPINE UNDER VARIED DIETARY CONDITIONS. *F. P.*

Underhill and M. E. Fisk. Ibid., pp. 364–370.

Abstracted as follows in Physiol. Abstr., April, 1931, vol. 16, pp. 51–52.

I. A superficial burn causes rapid subcutaneous edema with marked concentration of the blood. The edema reaches a maximum in twenty-four hours. Reabsorption of the fluid material is slow, going on for five or six days. Heat causing the superficial burn may penetrate very deeply, causing local circulatory changes in the body cavities which can yield ulcers previously attributed to toxic absorption. The general body temperature is very little affected, but if it rises after twenty-four hours it is due to infection.

II. The rapid edema is due to increased capillary permeability. Simultaneously absorption is decreased, and substances such as trypan blue are hardly absorbed at all from the burned area.

III. A superficial burn involving one-sixth of the body area gives in twenty-four to thirty-six hours a loss of fluid from the blood as edema equivalent to 70 per cent. of the blood volume. This loss greatly diminishes the efficiency of the circulation.

IV. There is less globulin in the serum of the burned animal and the edema fluid than in the serum of the nonfasting normal animal. There is a general resemblance between the serum and the edema fluid, but the latter contains rather more non-protein nitrogen, potassium, magnesium, and inorganic phosphorus.

V. As long as the blood concentration is maintained within normal limits following a burn, so long are the chlorides maintained constant. The body has marked power of compensating for chloride loss. Thirty-six per cent. of sodium chloride may be lost without causing an alteration in chloride content of the blood.

VI. Although a burn causes marked edema of tissue, it does not cause a great change in the tissues in regard to water, ash, or chloride, which, however, may be grossly lost from the blood. The sodium chloride content of the entire skin increases definitely, particularly in the burned skin; similarly for the ash, but the water content does not increase in the unburned skin. In burned muscle the water definitely increases, the chloride content rises excessively, but there is no increase in the ash. The chloride in the skin maintains its high value for three days and is still high after seven days.

VII. Severe dehydration by water deprivation or by an increased osmotic pressure of the blood causes the tissues to lose water, and as this is essential to them, death is an invariable consequence.

VIII. Repeated injections of pilocarpine cause a high concentration of the blood, which, however, returns to normal after the cessation of drug administration. Prolonged pilocarpine injections cause a sudden decrease in the blood below normal and a collapse. Poorly nourished animals are either hypersensitive or very refractory. In these animals during pilocarpine injections there is a decrease in water content of the skin, but an increase in water content of most organs provided a fresh vegetable diet is provided. In

general a lean animal loses more water than a fat one.

AN INVESTIGATION OF THE GASEOUS EXCHANGE AND OF THE LACTIC ACID AND ALKALI RESERVE IN THE BLOOD IN STATIC WORK. *M. Marschak. Arbeitsphysiol., Feb., 1931, vol. 4, pp. 1–19.*

1. In order to clarify the question of the effect of static work on the human organism, we have investigated the gaseous exchange and the lactic acid and alkali reserve in the blood during static work.

2. Measurements of oxygen consumption during the recovery period after static work (bow-bending) showed that during the first minute after the work, the oxygen consumption always increases. These results are in agreement with Lindhard's data.

3. The maximum oxygen consumption does not occur immediately after the work, but after a lapse of about twenty seconds; the carbon dioxide elimination and lung ventilation rate present a similar picture.

4. The lactic acid content in the blood gradually increases immediately after work, reaching its maximum value in four to five minutes.

5. The alkali reserve remains unchanged in most cases immediately after the work; in the later stages of recovery a significant decrease occurs.

6. The restoration of the oxygen consumption takes place much more quickly than the restoration of the lactic acid concentration and of the alkali reserve in the blood.—*Author's Summary.*

RELATION BETWEEN LENGTH OF WORKING MUSCLE AND ENERGY EXPENDITURE. PART I. *G. Lehmann. Arbeitsphysiol., Feb., 1931, vol. 4, pp. 71–85.*

A leg ergostat is described, which allows an optional variation of load and inertia, and at the same time makes it possible to record the force-distance diagram of the work performed.

Static work is performed less economically with the entire length of the working muscles than with a certain degree of shortening. With a further shortening, the expenditure of energy is greater.

Experiments with varying inertia yielded an optimum, with an energy curve falling off, after a steep rise, to almost a straight line at the end of the period of work.

RELATION BETWEEN LENGTH OF WORKING MUSCLE AND ENERGY EXPENDITURE. PART II. *S. Gorkin. Arbeitsphysiol., Feb., 1931, vol. 4, pp. 86–96.*

Using the apparatus described in Part I, the relation between energy expenditure during static work and the length of the muscles has been further investigated in experiments with lower and higher inertia, in which the force-distance and time-distance diagrams were simultaneously recorded. It is evident that the energy expenditure in dynamic work is dependent on the length of the muscles, just as in static work.

In the discussion it is shown that it is possible to calculate the energy expenditure for a motion whose effort and time curves are known, if one knows the specific energy expenditure for each muscle length.

The efficiency of an effort curve

which gradually declines toward the end of the motion, and the inefficiency of isotonic work, is due chiefly to the fact that the muscle works more and more uneconomically with increasing contractions.

AN INVESTIGATION OF THE ENERGY EXPENDITURE OF WOMEN ENGAGED IN CARRYING LOADS. *I. Okunewa and E. Steinbach. Arbeitsphysiol., Feb., 1931, vol. 4, pp. 20–34.*

The energy expenditure of three women subjects, while carrying loads on a barrow, was determined by the Douglas-Haldane method for the purpose of establishing a maximum permissible load for women. The findings in sixty experiments were as follows:

With subjects T. and N. no significant changes in the energy expenditure (expressed in cubic centimeters of oxygen) occurred in carrying 30 and 40 kg. for two bearers; the same was true for subject J. while carrying weights of 30, 40, and 50 kg. Loads of 60 and 70 kg. called for a definite increase in energy expenditure in subjects J. and N., as did 50, 60, and 70 kg. in subject T.

The energy expenditure in calories per 100 kgm. of work (in carrying loads horizontally) is minimum for subject J. with 50 kg. for two bearers, and for subjects T. and N. with 40 kg.; heavier burdens cause a definite increase in energy expenditure per unit of work.

The same results hold for all three subjects when energy expenditure per 100 kgm. of useful external work (deducting the energy expenditure necessary for walking without a load) is calculated.

The recovery period for loads of 30, 40, and 50 kg. lasts on an average from five to ten minutes; with heavier loads it lasts over thirty minutes.

On the basis of these findings we conclude that for our subjects 40 to 50 kg., carried by two persons by means of a barrow, represents a maximum permissible load from the standpoint of energy expenditure.

This assertion must, of course, be tested on women workers engaged in carrying loads during a whole working day, before deciding conclusively whether our laboratory results are applicable to actual working conditions. Such investigations we have already carried out, and the results will be published in a special article.—*Authors' Conclusions.*

THE USE OF A "BURLER'S" SEAT IN THE TEXTILE INDUSTRY. *Hirschberg. Abstr. as follows from Zentralbl. f. Gewerbehyg., Sept., 1930, N. S. vol. 7, pp. 263–264, in Bull. Hyg., Feb., 1931, vol. 6, p. 144.*

"Burling" is the term used in the textile industry for the task of looking over woven cloth to remove broken ends, etc., in the fabric. It requires practice and very good eyesight.

The author has an illustration of how the work is done in his district—a girl hunched up, bending with lowered head over the cloth spread out on her knees. Another illustration shows a suitable chair provided on which the worker can sit upright, and a small table in front which can be raised or lowered at will and over which the cloth is made to pass.—T. M. L.

HAZARDS OF COMPRESSED AIR, DIMINISHED PRESSURE, GENERATION AND USE OF ELECTRICITY, AND ELECTRICAL WELDING

HISTOLOGICAL CHANGES IN NERVE CELLS FOLLOWING INJURY. *O. R. Langworthy. Bull. Johns Hopkins Hosp., 1930, vol. 47, pp. 11–21.*

The nerve cell injuries that are discussed here involve both the nucleus and the cytoplasm. The nucleolus is considered to be very resistant, but a marked swelling of this structure may be seen in the cells. When death occurs immediately from electric injuries, many of the cells have nuclei that are shrunken and that stain a uniform deep color, so that nucleolus and chromatin strands may no longer be distinguished. The nucleus is often displaced to one side of the cytoplasm and is surrounded by a pale area indicating its former size. The suggestion is made that the cells with deep-staining shrunken nuclei have no longer the power of recovery. Abnormalities following less severe damage of the nerve cell are illustrated. The cytoplasm of the injured cells is shrunken, and the perivascular space is large. Immediately following the trauma, there is a considerable decrease in Nissl substance, and that which remains has lost its flaky appearance and looks coarsely granular. Often the edges of the cytoplasm appear to have no continuity, as if the cell had ruptured into the perivascular space. Swelling of the nucleolus occurs. A few hours after the electric shock the whole cytoplasm stains a uniform, deep color and no granules may be found. The Nissl substance is gradually reformed over a period of days, sometimes appearing first in the periphery of the cell and sometimes in the center around the nucleus. Restitution of the nucleus takes a longer time. Cells that are injured beyond possibility of recovery become greatly shrunken, and cytoplasm and nucleus stain a uniform black color. Such cells are removed by phagocytosis. The electric current has a selective effect on the nerve cells; some anterior horn cells are greatly injured while others are fairly normal. —*Author's Summary.*

PHYSIOLOGIC EFFECTS OF HIGH FREQUENCY CURRENT: RESPIRATORY METABOLISM AND CHANGES IN BLOOD OF ANESTHETIZED DOGS. *E. S. Nasset, F. W. Bishop, and S. L. Warren. Abstr. as follows from Am. Jour. Physiol., Feb., 1931, vol. 96, p. 439, in Jour. Am. Med. Assn., April 18, 1931, vol. 96, p. 1338.*

Experiments are described by Nasset and collaborators which show that high frequency current as applied to anesthetized dogs is capable of raising their average body temperature 3.6 to 8.5°C. The respiratory metabolism was increased 27 to 172 per cent. The rate of respiration in some cases increased twenty-five fold. Whole blood carbon dioxide content, as well as plasma carbon dioxide content, was decidedly diminished. When the average body temperature reached 41° or 42°C., the blood sugar concentration fell rapidly while the non-protein nitrogen concentration showed a large increase. The blood chloride concentration failed to exhibit any gross change. The location of the electrodes, whether across the head or across the trunk, did not influence the character of the results.—C. K. D.

SOME REMARKS ON DEATH AND APPARENT DEATH DUE TO THE ACTION OF ELECTRIC CURRENT. *R. de Josselin de Jong. Nederl. Tijdschr. v. Geneesk., Feb. 7, 1931, vol. 75, p. 563.*

INDUSTRIAL ENVIRONMENTAL CONDITIONS

PHYSIOLOGIC AND HYGIENIC EXPERIMENTS ON THE INFLUENCE OF ENVIRONMENTAL WORKING CONDITIONS UPON INDUSTRIAL WORK. PART I. PHYSIOLOGIC AND HYGIENIC EXPERIMENTS IN THE MANUFACTURE OF BOTTLES. *J. Dobrin, N. Kudrjawzew, J. Lessen, M. Sirota, and L. Tutkievitsch. Arbeitsphysiol., Feb., 1931, vol. 4, pp. 35–70.*

This is an interesting study of air conditions in a bottle factory, and of the biologic effects upon the worker, during the hot months of July and August.

Measurements of temperature, humidity, and air movement at three points, 0.3, 0.9, and 3 meters away from the oven, showed a definite relationship between indoor and outdoor conditions. Little or no effect could be detected on temperature and humidity when a current of air from a ventilating system was blown directly against the oven at a rate of about 12,000 cu.m. per hour. This air supply represents about 5 per cent. of the natural air recirculation around the oven by temperature difference. The radiant heat to which the workers were exposed varied from 10 calories per square centimeter at the oven to about 5 calories at a distance of 1 meter from the oven.

In the course of the working shift, production fell about 18 per cent. With ventilation, the output was from 12 to 15 per cent. higher than with no ventilation.

The body temperature, pulse rate, and systolic blood pressure increased in the course of the working shift, while the diastolic pressure as a general rule decreased (four subjects). The rise in body temperature was about 1.2°C. in the day time, and somewhat less at night. The loss in weight by perspiration, after correcting for food, drink, and excreta, varied from 1,600 to 4,700 gm., and it always exceeded the simultaneous water consumption. In most instances, the blood solids, and particularly the chlorides, decreased.

According to the authors, the most consistent results are obtained by multiplying the pulse rate into the pulse pressure. This product increased with work as much as three times its normal level, and it was considerably higher in day work than in night work. No definite relationship could be found between subjective sensations of comfort and objective changes in air conditions, and biologic factors.—L. C. B.

A STUDY OF VENTILATION AND RESPIRATORY ILLNESS IN NEW YORK SCHOOLS; COMPARISON OF WINDOW-GRAVITY VENTILATION AND OF UNIT FAN VENTILATION WITH VARYING AIR FLOW. *R. Cole, D. D. Kimball, F. S. Lee, G. T. Palmer, E. B. Phelps, E. L. Thorndike, and C.-E. A. Winslow. Am. Jour. Hyg., Jan., 1931, vol. 13, pp. 235–254.*

The problem of schoolroom ventilation in relation to the health of the pupils has been the subject of many studies and controversies in the past

twenty years, and some of the disputed points still remain obscure.

The first studies of the New York State Commission on Ventilation suggested that systems of mechanical ventilation are not only wasteful but that they also lead to higher rates of respiratory illness among pupils than do the simpler natural methods, with window supply and gravity exhaust. The alleged inferiority of mechanical systems was attributed mainly to the higher room temperatures necessary on account of the more rapid change of air in the rooms supplied by fans. Subsequent studies repeated by the Commission and by others, under somewhat more comparable conditions, yielded similar results as far as the incidence of respiratory illness is concerned.

More recent and much more thorough studies of the Commission, however, do not confirm the earlier findings. In fact, in some respects they seem to be contradictory. The incidence of respiratory and other forms of illness among pupils was not affected by the temperature, the rate of air flow, or the velocity of air in the classrooms. The apparent superiority of the window-gravity methods in the earlier studies is attributed, in these recent reports, largely to uncompensated variables, such as race, age, sex, social and economic status, the distance the pupils had to walk to reach school, and above all to the inability of the observers to diagnose respiratory illness. Special tests on the ability of the school nurses to diagnose respiratory illness in a given group of children disclosed that the best agreement between any two nurses was in the ratio of one to three, and the worst agreement was in the ratio of one to nine. Presumably, this ratio was even smaller in the Commission's first studies, in which the diagnosis was made by teachers and parents.

The experiments described in the present report were designed for the purpose of checking the conclusions arrived at in the preceding two studies. The points on which confirmation was sought were: (*a*) whether an air supply of 15 cubic feet per minute per student is as satisfactory as the standard one of 30 cubic feet per minute required by law; and (*b*) whether methods of window-gravity ventilation are just as good as unit-mechanical methods, when the air supply in both is about 15 cubic feet per minute per student.

Three New York schools were employed in this study. In each school, comparisons were made between sets of rooms matched in all particulars except for the amount of air supply or the method of ventilation. The incidence of respiratory diseases among pupils was again taken as the criterion of healthfulness of air conditions, but in this study "the observations of a nurse in one series of rooms were tested against those of the same nurses in another series of rooms, in the same school." By this method the authors claim to have succeeded in eliminating the personal equation and to have secured results that were highly concordant.

As far as the observations go, no significant differences could be detected throughout this study. Reducing the air supply from 30 cubic feet per minute to 16 cubic feet per minute produced no apparent harmful effects, and the unit ventilated rooms showed no significant superiority over

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the window ventilated rooms, from the health standpoint.

The authors give no data on the number of students in each set of matched rooms, nor do they state whether an air supply of 15 cubic feet per minute per pupil was sufficient to keep the odors below the threshold of perceptibility. The engineer is also interested to know something about the exposure of the matched rooms with reference to prevailing winds, and whether the air and temperature distribution laterally were equally good in the naturally and mechanically ventilated rooms. Just what bearing these factors might have on health and on the applicability of natural ventilation methods is another question.

In the light of our present knowledge of the requirements for schoolroom ventilation, it is fair to say that the window-gravity methods are as satisfactory as the mechanical methods for the representative class of schoolrooms tested by the Commission.

Health officials and ventilating engineers will find this final report exceedingly interesting and informative in view of the heated resolutions adopted by the American Public Health Association in 1925.—C. P. Y.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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GENERAL

PREVENTION OF INDUSTRIAL DISEASES. *E. L. Collis. Jour. State Med., May, 1931, vol. 39, pp. 249–256.*

Health and disease in industry have two aspects, the personal and the environmental. The first is concerned with the man and his behavior, and the second with conditions of employment. When aiming at maintaining health in industry, the first objective is so to fit workers to their work that labor turnover is reduced to a minimum. Action on these lines simultaneously reduces the incidence of accidents and increases output, because newcomers always show a disposition to sustain accidents, and, owing to lack of skill, are inferior workers. Next, steps must be taken to provide good environment for work by attention (1) to atmospheric conditions of temperature, humidity, and cooling power; (2) to general and local illumination; (3) to the removal of all injurious fumes and dust; and (4) to the provision of washing accommodation for keeping the skin clean. Last, but not least, hours of work must be so planned that the ideal work curve can be attained by a scientific use of rest pauses, and the introduction of labor saving appliances.—E. L. C.

REPORT OF THE DIVISION OF INDUSTRIAL HYGIENE, NEW SOUTH WALES. *Rep. Dir.-Gen. Pub. Health, New South Wales, for 1929, pp. 55–58. Sydney, 1931.*

During the year, about 500 coal miners were examined in order to establish the amount of fibrosis of the lungs normally present among such men. The results of the investigation are to be published later. At the same time these men were examined to determine the incidence of nystagmus, which, it is stated, was found similar to that described by European investigators.

An inquiry among bakers as to the cause of dermatitis proved interesting, since it was found that all those who had suffered had been using yeast foods or accelerators containing ammonium or potassium persulphate, and that the dermatitis broke out a few months after the introduction of this chemical. The reaction to ammonium persulphate in 5 to 10 per cent. solutions consists in great wheals and marked erythema, often persisting for days; this substance may light up a resolving dermatitis.

The conditions found in the accumulator industry are adversely noted, since, in this new trade, no craft traditions of hygiene exist. Scrupulous cleanliness is needed, particularly with regard to the suppression and removal of all lead dust generated when manipulating battery plates and pasting.

A new risk is noted in connection with the use of X-ray machines in the boot departments of city shops. The machines investigated revealed a definite hazard owing to insufficient protection around the screen, with a leakage of rays through the walls. Nevertheless, since over twenty minutes of exposure would be necessary to produce a burn, there is little danger to customers unless exposure is several times repeated; on the other hand, there is a definite risk to the operators, and all machines should be licensed after inspection, while customers might be warned not to expose their feet for more than three minutes in any one month.—E. L. C.

INJURIES AND DISEASES OF THE MOUTH AND TEETH OF GLASS BLOWERS, AS WELL AS THEIR TREATMENT AND PREVENTION. *W. Herrmann. Abstr. as follows from Zentralbl. f. Gewerbehyg., July, 1930, N. S. vol. 7, pp. 193–197; Aug., 1930, pp. 218–223, in Bull. Hyg., April, 1931, vol. 6, p. 321.*

This is a very thorough article by a dentist who has made good use of the material coming before him. He treats of syphilis communicated by the common use of the blowpipe and points out what opportunities favor it in the lesions to the lips from the iron end of the pipe. Sometimes he says almost the whole gang around a glass furnace may suffer from stomatitis ulcerosa. He discusses at length the common appearance of mumps, of the air tumors or inflations over the parotid area, and the gray plaques that form on the mucous membrane of the cheeks as though lunar caustic had been rubbed on them, and which are present in 90 per cent. of the blowers.

He is most at home when describing in detail the remarkable erosion caused by the rotation of the end of the blowpipe on the upper and lower incisors,

canines, and bicuspids; the darkening of the tartar owing to deposit of iron oxide (Fe_2O_3) derived again from the blowpipe; the eroding action on the teeth from exposure to the fumes of hydrofluoric acid in the preparation in recent years of opal glass, and the damage inflicted by bacterial infection following on these lesions. As he rightly remarks, prevention to a great extent is being found in the very ingenious automatic machines for blowing glass.—T. M. L.

ACCIDENTS AND DANGERS TO HEALTH FROM REFRIGERATING MACHINES. *J. Wenzel. Schrift. a. d. Gesamtgeb. d. Gewerbehyg., N. S. no. 32, 1930, pp. 74. Abstr. as follows in Bull. Hyg., April, 1931, vol. 6, p. 318.*

This brochure deals with the various apparatus employed in refrigerating, the risks of accident and statistics showing the number, the physical and technical processes involved in the production of cold, requirements in the construction of refrigerators, explosion and fire risks, health dangers, and rules for normal management and breakdowns.

It deals separately with: (1) production of ice; (2) liquefaction of air, oxygen, and nitrogen; and (3) small domestic refrigerators.

Official statistics show that in the year 1927, of 3,176 accidents (forty-nine fatal) from steam boilers, pumps, compressors, etc., including refrigerators, refrigerating machines accounted for 124 (3.91 per cent. of the whole), two of which were fatal. The author, however, remarks that as there are probably 5,000 large, and 45,000 small domestic refrigerators installed in Germany, the number of accidents is small.

The section on dangers to health states that while sulphur dioxide, ammonia, and carbon dioxide constitute the main gases used in refrigerating machines, several others, methyl and ethyl chloride, etc., are in use.

Emphasis is laid on the fact that the risk from sulphur dioxide and ammonia, though irrespirable gases, is paradoxically less, as they give immediate information of their presence and lead to immediate evacuation of the place in which the escape has occurred. Similarly with carbon dioxide, the asphyxiating dose is so high (800 to 1,000 parts per 10,000) that it is not likely to be reached. Hence, the nonodorous but less toxic gases such as methyl and ethyl chloride, which have an anesthetic effect similar to, but less marked than, chloroform, are really the more dangerous.

The article contains several references to American conditions.—T. M. L.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

ON THE OCCURRENCE OF OCCUPATIONAL CANCER IN VARIOUS COUNTRIES. *B. Koinuma. Abstr. as follows from Gann, 1930, vol. 24, p. 416, in Am. Jour. Cancer, April, 1931, vol. 15, p. 947.*

A committee was organized in 1928 in accordance with a request from the

Department of Hygiene of the League of Nations to investigate the occurrence of occupational cancer throughout the world. At the first meeting, which was held in London, July, 1928, it was decided to limit the investigation to cancer of the lungs and cancer of the skin. Statistical studies were made by the representatives of the various countries in regard to workers handling tar, pitch, coal tar, and mineral oils. They reported their findings to the Department of Hygiene of the Bureau of Labor. Koinuma made a résumé of these reports from the following countries: Austria, Belgium, Italy, Holland, Switzerland, and Japan. These indicated that occupational cancer was nonexistent or rare, although cancer of the skin, lips, face, bladder, penis, or scrotum was found in fair numbers. In this respect these countries differ from England, where occupational cancer is frequently observed. Reports from the United States, Canada, Poland, Sweden, Norway, Soviet Russia, and Australia were incomplete and are therefore omitted in the paper.

In Japan, Koinuma conducted an investigation of industries where carcinogenic agents are handled, including the dry distillation of coal and tar, the manufacture of coal gas, briquettes, graphite, tar and pitch, petroleum refining, the manufacture of paraffin, industries using creosote oil, asphalt refining, ink manufacture, the manufacture and use of lacquer, the manufacture of arsenous acid and aniline, cotton spinning, and metal mining, his object being to determine whether or not men and women engaged in these industries were afflicted with cancer of the skin, bladder, or lungs. The results of his investigation showed that there was no occupational cancer. However, there were a great many cases of dermatitis among the laborers, especially those engaged in factories handling machine oil (spinning mills), petroleum, coal tar, and pitch. The statistical analysis covered data from 1915 to 1928, inclusive.

OCCUPATIONAL CANCER IN AMERICA. *F. G. Pedley. Abstr. as follows from Canadian Med. Assn. Jour., Sept., 1930, vol. 23, p. 428, in Am. Jour. Cancer, April, 1931, vol. 15, p. 948.*

This is an editorial comment on Heller's article on occupational cancer which appeared in THIS JOURNAL (1930, vol. 12, p. 169), calling attention especially to the occurrence of occupational cancer in America.

INDUSTRIAL CANCER, ESPECIALLY THE TYPES OCCURRING IN GERMANY. *O. Teutschlaender. Abstr. as follows from Ztschr. f. Krebsforsch., 1930, vol. 32, pp. 614–627, in Am. Jour. Cancer, April, 1931, vol. 15, pp. 947–948.*

This paper is a general survey of industrial cancer, the facts which it contains being mostly extracted from the literature of the subject. The author first discusses the carcinoma of the lung which occurs in the Schneeberg miners, as well as those at Joachimsthal.

The second group comprises the cancers of the bladder in those working in the chemical industries. It is interesting that according to Leitch this type of cancer does not appear in workers in the chemical industry in England because of the better ventilation of the factories. In contrast, soot cancer is almost entirely an

English variety; the disease is scarcely known in Germany.

The third group comprises X-ray cancer, cancer of briquette workers, mule spinners' cancer, which has not appeared in Germany, and paraffin cancer among those who work in the petroleum industry. The pitch type is fairly common in Germany. The writer reports that there are only fourteen factories which he has investigated, but in these he found nine cases of skin cancer. These pitch cancers, like so many other industrial cancers, occur in over 54 per cent. on the scrotum.

Finally the writer calls attention to the fact that almost all of the industrial cancers require an exposure of approximately ten years before the growth appears, though a few cases may arise much later. With the exception of the Schneeberg cancer of the lungs, all of the industrial cancers can be experimentally produced in animals. Necessary protective measures to prevent the occurrence of such industrial cancer are usually of the simplest nature, *i.e.*, the necessary hygiene and cleanliness of the workmen and satisfactory ventilation. Certain types of manufacture, especially with pitch, should be abandoned.

While the paper is an excellent survey, it unfortunately suffers in that there is no bibliography.

THE INCIDENCE OF CANCER OF THE BLADDER AND PROSTATE IN CERTAIN OCCUPATIONS. *S. A. Henry, N. M. Kennaway, and E. L. Kennaway. Jour. Hyg., April, 1931, vol. 31, pp. 125–137.*

The certificates for deaths which occurred between 1921 and 1928 in England and Wales, in cases of cancer of the bladder in males, are analyzed in this article, with regard to the occupation of the deceased. Owing to the statistical difficulties described, the incidence of these forms of cancer is presented for only forty-six occupations. Cancer of the prostate was also considered, as a type which probably had no occupational bias, but for reasons given, it was not found useful for comparison. General open air occupations with no exposure to industrial vapors and dust were found with a low incidence of cancer of the bladder. On the other hand, fifteen occupations were found with a ratio greater than 150—a figure of 100 being taken as the standard for the general population. Five of these fifteen involved exposure to coal gas, tar, or pitch, three showing the highest ratios on the list, namely, 333, 400, and 400. When the ten occupations in the list associated with exposure to coal gas, tar, pitch, or soot are considered, eight of them are found with an incidence of cancer of the bladder greater than that of the general population—from one and one-half to four times as great, in five instances.

This paper establishes the fact that occupational exposure to coal tar products may be associated with the occurrence of cancer of the bladder, although the connection between this exposure and other forms of skin cancer is more definitely accepted. The way in which different parts of the body are affected by cancer due to occupational exposure is displayed; pitch workers suffer particularly for various parts of the skin, but also in excess for the bladder and the scrotum. Chimney sweeps, coke oven men, and

mule spinners suffer particularly on the scrotum and also on other parts of the skin, but the first two named do not experience cancer of the bladder; on the other hand, chemical workers get cancer of the bladder, but not of other parts of the skin. The results suggest that the skin serves as a very effectual first line of defense to the urinary tract. The authors point out that the whole question requires much further investigation, but they publish the facts now rather than wait a long period of years while more data accumulate.—E. L. C.

CANCER OF THE LUNG IN MINERS IN JOACHIMSTHAL, CZECHOSLOVAKIA. *H. Sikl. Abstr. as follows from Ztschr. f. Krebsforsch., 1930, vol. 32, pp. 609–613, in Am. Jour. Cancer, April, 1931, vol. 15, p. 948.*

The writer has found that there is just as much carcinoma in the miners in Joachimsthal as there is among the Schneeberg cobalt miners. Of ten miners autopsied within a period of eighteen months, of fifteen who died, eight were found to have carcinoma of the lung. The average age was 49 years and the average period of service in the mines was about seventeen years. Chemical analysis of the lungs of one of these men showed that there were no important foreign elements present; especially no trace of lead, bismuth, arsenic, cobalt, nickel, or uranium could be found. The test for radioactivity also was entirely negative. Nevertheless, the writer thinks that the radioactive emanation, which is very strong in the air of the mines, may have something to do with the presence of the carcinoma.

FUNCTIONAL ALBUMINURIA. *R. S. Palmer. Jour. Am. Med. Assn., May 9, 1931, vol. 96, pp. 1559–1562.*

1. Slight traces of albuminuria in young male adults without other signs of renal disease is of comparatively little significance, persisting in only one of thirty-five cases followed after eight years and having occurred transiently in one other, there being no symptoms of renal disease in any case.

2. Factors associated with functional albuminuria are underweight and a positive family history of vascular disease.

3. Poor posture was not found significant in this series.

4. The pathogenesis of functional albuminuria is not clear but is probably local and may be the result of stasis producing a local acidosis.

5. No treatment of the condition is indicated. Individuals exhibiting this sign should not be excluded from normal physical exercise.—*Author's Summary.*

AFFECTIONS OF THE NERVOUS SYSTEM AMONG TEA PACKERS. *F. Sabugin. Abstr. as follows from Zentralbl. f. Gewerbehyg., June, 1930, N. S. vol. 7, pp. 169–177, in Bull. Hyg., April, 1931, vol. 6, pp. 320–321.*

In this lengthy paper the subjective symptoms complained of are described among 82 persons (48 men and 34 women) engaged in the fourteen processes of tea packing. They were: pains in the upper and lower extremities and back, feeling of numbness in the arms, headache, vertigo, general weakness, palpitation, apathy, sleepiness, and wasting. Of 72 persons who were examined, 32 were found to have

tremor of the eyelids, 16 tremulous tongue, 17 tremor of the arms, 13 nystagmus, 38 exaggerated knee jerks, 63 loss of the pharyngeal reflex, 18 disturbed sensation in the arms, 36 thinning and polishing of the nails, and 19 depression.

The symptoms pointed to some interference with the normal functions of both the peripheral and the central nervous systems.

Subsequently examination was made in the tea packing establishment where further subjective symptoms (double vision and aphonia, etc.) were noted, and similarly additional pathologic signs (unequal pupils, etc.). All were affected and the symptoms were more marked at the end of the day's work.

The relation of the symptoms and signs to fatigue is then discussed very fully. The conclusion arrived at is that the symptoms are due to a slight neuritis, the result of overpressure of work or excessive zeal to work, in the production of which toxic doses of caffein (which was found to be present in the dust in the air of the workroom to the extent of 2 per cent.) could not be excluded.

[No mention is made of lead absorption from the tin foils used in packing tea as a conceivable, if unlikely, cause of the symptoms.]—T. M. L.

ATROPHY OF THE MUSCLES FROM THE USE OF COMPRESSED AIR TOOLS. *Beintker. Abstr. as follows from Arch. f. Gewerbepath. u. Gewerbehyg., 1930, vol. 1, pp. 376–379, in Bull. Hyg., April, 1931, vol. 6, pp. 321–322.*

A description is given of the injurious effect on three coal miners; one of them had to give up work owing to atrophy of the muscles of the left shoulder. The infraspinatus muscle completely disappeared, so that the surface of the shoulder blade with its prominences could easily be felt. On the right side the same muscle appeared to be slightly affected. The left biceps was definitely weaker than the right, and felt flaccid; the triceps and muscles of the forearm remained unaffected; the left thenar eminence was flattened.

The second case was a miner of twenty-five years of age, who, owing to an accident four years previously, had been able to work only with his left arm. Owing to pain and weakness of this left arm he had to cease work. As in the previous case, the left shoulder blade was very distinct; the left pectoralis major was considerably wasted; the ribs were more easily felt on the left than on the right side. The triceps on the left side had completely disappeared and could not be felt. The biceps was present although more flaccid and much weaker than the right. No effect was noted in the thenar or the hypothenar eminences.

The third case showed atrophy of the right thenar eminence. Beintker states that the compressed air causes a vibration of the tool at the rate of 200 to 500 times per minute. He points out how seldom lesions have been reported although these tools have been in use for twenty-five years.

He refers to a description of a few similar cases; they are to be regarded, in his opinion, as cases of a progressive, spinal muscular atrophy.—T. M. L.

THE ETIOLOGY OF ACUTE UPPER RESPIRATORY INFECTION (COMMON

COLD). *P. H. Long, J. A. Doull, J. M. Bourn, and E. McComb. Jour. Exper. Med., April, 1931, vol. 53, pp. 447–470.*

Experimental upper respiratory infections similar to "common colds" were transmitted singly and in series through two and four passages in nine out of fifteen persons, by intranasal inoculations with bacteria-free filtrates of nasopharyngeal washings obtained from individuals ill with natural "colds." These observations conform with those reported by previous workers and lend further support to the view that the incitant of the "common cold" is a filtrable virus.—*Authors' Conclusion.*

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

INFLAMMABLE OR POISONOUS FLUIDS USED IN HAIRDRESSING ESTABLISHMENTS. *P. Cazeneuve and G. Bertrand. Bull. Acad. de méd., 1931, no. 13, pp. 538–547.*

Attention is drawn to the risk, both for those who are at work, and for their clients, arising from the use of inflammable or poisonous fluids in beauty parlors and hairdressing salons. The substances commonly used are carbon tetrachloride, benzene, and petrol. These substances are sent out in mixtures to which perfumes are added, with the information that they are noninflammable and not explosive; yet one was found to contain 30 per cent. benzene and 70 per cent. tetrachloride, while others were made up of from 50 to 72 per cent. tetrachloride, together with petrol. Evidence is quoted from various countries to establish the toxicity of carbon tetrachloride, which is more poisonous than chloroform, in as much as it contains one extra chlorine atom to the molecule. The authors recommend that the Academy of Medicine press for the prohibition of inflammable and poisonous substances in hairdressing. Such prohibition exists today in Paris, but the regulation has not been enforced. —E. L. C.

APPARATUS FOR DEFENSE AGAINST TOXIC GASES. *R. Marcille. Abstr. as follows from Compt. rend. Acad. d. sc., 1931, vol. 192, pp. 382–384, in Chem. Abstr., April 20, 1931, vol. 25, p. 1924.*

The principle of the apparatus is as follows: Respiration takes place in a closed bell; the expired air is passed into a soda solution which absorbs the carbon dioxide, the diminished volume of air being supplemented by pure oxygen from a small tank of compressed gas. Such an apparatus weighing 10 kg. maintains comfortable respiration for one person for two to three hours. The apparatus is inexpensive and light in weight and may also be made of sufficient size to protect several people at the same time.—P. D.

INDUSTRIAL POISONING WITH ANILINE AND SIMILAR SUBSTANCES. *A. Bonzanigo. Abstr. as follows from Deutsch. Ztschr. f. d. ges. gerichtl. Med., 1931, vol. 16, pp. 242–245, in Chem. Abstr., May 10, 1931, vol. 25, p. 2214.*

Cases are described of poisoning with aniline, nitrobenzene and dinitrobenzene, nitrochlorobenzene and dinitrochlorobenzene, phenylhydrazine and phenetidine and benzene.—P. D.

BENZENE (BENZOL) POISONING. *A. Hamilton. Arch. Path., March, 1931, vol. 11, pp. 434–454; April, 1931, pp. 601–637.*

This is one of the reviews which the *Archives of Pathology* publishes from time to time summarizing the available data on a given subject. It treats of acute and chronic benzene poisoning both clinical and experimental, under which last head are included those cases of poisoning which have developed in the course of benzene therapy for leukemia.

The major part of the review deals with experimental poisoning in animals, for the data with regard to clinical cases are surprisingly scanty. The literature yields only eighty-five white cell counts with fifty-six differential counts, and seventy red cell counts, while platelets are mentioned only forty-four times, the bleeding time is given in only twenty reports, and such tests as the fragility of the red cells, the icterus index, and the presence of blood coloring matter in the urine are lacking except in rare instances. Nevertheless, the collected data show a fairly wide variation from the typical, textbook picture of chronic benzene poisoning, such as: slight leukopenia with marked anemia; absence of mononucleosis; high color index; variations in size, shape, and staining properties of the red cells; nucleated red cells; and youthful forms of leukocytes. The clinical picture also is subject to fairly wide variations. Thus, there are cases of thrombopenia without apparent hemorrhage, or with only retinal or uterine hemorrhage; cases of marked buccal sepsis—sometimes with Plaut-Vincent organisms in the mouth—indistinguishable from Schultz' agranulocytic angina; and cases with involvement of the central nervous system, resembling pernicious anemia.

The pathologic material is even more scanty. Only twenty-nine recorded autopsies are to be found in the literature, to which the author adds seven unpublished records, six contributed by H. S. Martland of Essex County, N. J., and one by MacCallum of Johns Hopkins. Even among these thirty-six, variations from the accepted type are found and the author argues for a more flexible standard in the diagnosis of benzene poisoning, pointing out the wide variations which are accepted in regard to so-called agranulocytic angina, and the blood diseases caused by irradiation. The most important factor in the diagnosis of benzene poisoning is the proof of exposure to this poison, and the resulting blood disease may represent one of several types, according to the particular part of the marrow that suffers the greatest damage.—E. D.

CLINICAL SYMPTOMS AND TREATMENT OF CHRONIC INDUSTRIAL BENZENE POISONING. *H. Schneider. Abstr. as follows from Med. Klin., 1930, vol. 26, pp. 1112–1114, in Bull. Hyg., April, 1931, vol. 6, pp. 323–324.*

The author describes very fully two cases (one fatal) among indiarubber workers; the patients were father and son.

When the father, aged 59, entered the hospital, the blood picture showed 2,200,000 red cells, 4,640 white; differential count: 42 per cent. neutrophils; 44 per cent. lymphocytes; 6 per cent. monocytes, 8 per cent. neutrophil myelocytes. Stress is laid on the fat-

ness of the patient as indicating a benzene effect. Transfusion was performed without apparent benefit. He left in eight days' time, undergoing treatment with arsenic and iron; in two months he returned with a blood picture of 1,690,000 red cells, 5,800 white; the differential percentage count was: neutrophils, 40; lymphocytes, 55; monocytes, 1; neutrophil myelocytes, 3; basophil myelocytes, 1. Further blood transfusion was given, and after this the number of leukocytes rose to 17,000. The man again took his discharge and became a difficult patient, and was reported to have died one month later.

In the case of the son, the blood picture showed first 2,340,000 red cells, 1,320 white, with a differential percentage count of 54 neutrophils, 1 eosinophil, 44 lymphocytes, 1 monocyte. Treatment consisted of three electroferrol injections intravenously per week, and as the last led to a rise in temperature, it was replaced by arsenic and iron. The white blood count fell as low as 740; he then received a transfusion of 400 c.c. which was followed by a rise in temperature to 39.6°C. and passage of dark brown urine with a great deal of albumin and blood. This was followed by jaundice and minute hemorrhages in the mucous membrane. Four days after the transfusion, his temperature fell quickly to normal and remained so. The erythrocytes numbered 1,820,000 and the leukocytes 1,200. With the administration of Blaud's pills and a vitamin rich diet, the blood picture remained unchanged for one month, but improved considerably after a further month's treatment, and when he left the hospital the erythrocytes numbered 3,570,000, and the white cells 3,400. The effect of benzene in damaging the bone marrow is discussed in regard to the leukopenia and the lymphocytosis, and also in the changes found in the urine, the increase of urobilinogen, etc.

While recommending restrictions on benzene, if they cannot be obtained, the author recommends the exclusion of young women and fat persons.—T. M. L.

EXPERIMENTAL TESTS OF THE EFFECT OF INHALATION OF SMALL QUANTITIES OF BENZINE AND BENZENE ON THE RESPIRATORY SYSTEM AND THE BODY GENERALLY. *M. Schmidtmann. Abstr. as follows from Klin. Wchnschr., 1930, vol. 9, pp. 2106–2108, in Bull. Hyg., April, 1931, vol. 6, p. 323.*

The writer states that in recent years an increase in the number of deaths from bronchial cancer has been observed, the cause of which is unknown. It has been suggested that increasing motor traffic, either through the exhaust gases or from the dust of the tarred streets, may have something to do with it. This is the basis for Schmidtmann's experiments.

Eight rabbits, twenty-four guinea-pigs, forty-eight rats, and 100 mice were made to inhale, in a gas cage measuring 60 by 60 by 60 cm., fumes of 0.2 c.c. of the following substances: (1) dapolin, shell, strax, motalin; (2) pure benzene; (3) mixtures of (*a*) benzine and benzene, and (*b*) benzine and alcohol.

The animals were left for two hours in the experimental cage three times a week. Later on, street dust was added to the fumes that were inhaled.

No increase in the bronchial

epithelial cells was found, even after twenty months of inhalation. Changes did occur, such as emphysema and bronchitis with more or less pronounced epithelial proliferations and atelectatic pneumonias.

The effect on the blood forming organs, however, was much more apparent and gradually, in these experiments, the same picture as from experimental benzene poisoning was obtained. The spleen and red bone marrow were particularly affected.—T. M. L.

CARBON MONOXIDE POISONING IN THE HAT INDUSTRY. *M. R. Mayers. Abstr. as follows from N. Y. State Dept. Labor, Indust. Hyg. Bull., Aug., 1930, vol. 7, pp. 5–6, in Bull. Hyg., April, 1931, vol. 6, p. 324.*

The women's hat industry in New York is concentrated in one quarter of the city, where, with but little capital, a hat factory may be established using gas presses and boilers of imperfect design. Danger from carbon monoxide arises in two ways, either from imperfect combustion of the gas, particularly when the flame plays upon a cold metallic surface, or from leaking pipes. The pipes used are frequently of perishable rubber, and this source of carbon monoxide is undoubtedly the greater hazard of the two. Employers should be educated in the injuries to health resulting from leaking gas, and in the need for using standard flexible tubing as approved by the American Gas Association. Efforts are made to remove the products of combustion by placing over the hat presses exhaust hoods connected with suitable exhaust fans; but they are by no means always efficient. The author holds that there is here a definite occupational hazard which can be, and should be, prevented.—E. L. C.

THE HEALTH OF THE WORKER IN CHROMIUM PLATING. *H. B. Trumper. Brit. Med. Jour., April 25, 1931, vol. 1, pp. 705–706.*

An account is given of the process of chromium plating, in which metal articles wired to a frame are placed in an electroplating vat holding a solution containing 50 per cent. of chromic acid. When the current is on, hydrogen evolved from the cathode forces up a spray composed of 60 per cent. chromic acid. This spray, if not adequately removed by exhaust ventilation, creates a hazard for the workers.

Dermatitis on the hands, arms, and face may appear suddenly, but seldom does unless the worker has been exposed to risk for at least six months. A septic process in the body of the worker seems as necessary as exposure to the moisture laden atmosphere. In a severe case the face is intensely red, and swollen beyond recognition. As soon as irritation has ceased, after two days in bed with the part affected treated with calamine lotion, the patient should resume work in the plating shop; if he remains away from work until the cure is complete, there is a liability to recurrence on resuming work.

Chrome ulcers occur most commonly on the knuckles of the hands or the dorsum of the foot; they are typical crater shaped chrome holes, indolent and slow to heal. Ulceration with perforation of the septum of the nose also occurs. The ulcers and perforation seem to be quite independent

of general health, and only to depend upon the hazard. Usually no evidence of poisoning by chromium is seen, although in a few instances of dermatitis, vomiting preceded by profuse salivation occurred. Efforts to trace chromium in the urine failed. Out of fifty patients, thirty-three suffered from dermatitis, four from nasal ulceration, nine from ulcers on the hands or feet, and four from vomiting. For the prevention of disablement, measures are suggested that have proved successful in abolishing the sickness rate which caused at least 10 per cent. of the personnel of the chromium plants to be absent.—E. L. C.

THE TOXICITY OF ETHYLENE OXIDE. *Koelsch and Lederer. Abstr. as follows from Zentralbl. f. Gewerbehyg., Sept., 1930, N. S. vol. 7, pp. 264–266, in Bull. Hyg., April, 1931, vol. 6, p. 324.*

The protocol is given of inhalation experiments on four cats and a dog. The results showed ethylene oxide to be distinctly toxic. In low concentrations it leads to severe and sometimes fatal effects; noticeable is the delayed action showing itself especially in diminution in weight as a result of changes brought about in metabolism. The narcotic effect is apparent and paralysis of the limbs was seen. Microscopically stasis and hemorrhages were found in the brain, and blood pigment in the spleen and in the liver.

The importance of the results is emphasized in connection with the use of the substance as a means of offense (tear gas).—T. M. L.

THE TOXICITY OF ATMOSPHERES CONTAINING HYDROCYANIC ACID GAS. *J. Barcroft. Abstr. as follows from Jour. Hyg., 1931, vol. 31, pp. 1–34, in Bull. Hyg., April, 1931, vol. 6, pp. 359–360.*

The toxicity of hydrocyanic acid gas for various forms of life is here considered and concentration-time curves are presented for goats, monkeys, rabbits, rats, cats, dogs, guinea-pigs, mice, fowl, pigeons, and canaries. The dog is the most sensitive of all the mammals tested, the lethal time of exposure to a concentration of 1.0 mg. per liter of air being 0.8 minute. For the monkey the corresponding figure is 3.5. The goat is able to tolerate more than twice the concentration which will kill the dog, and the guinea-pig four times that which will kill the rat. These species differences are discussed. The experiments show that many animals are overcome by this gas before man; in fact almost any smaller animal is so overcome. Undoubtedly, by reason of their extreme sensitiveness, the best indicators are birds. The concentrations at which the pigeon will vomit, or the canary will die, are approximately the same; over short periods of time, say up to ten minutes, they are negligible as compared with the concentration which would affect man. Treatment of cyanide poisoning is discussed with reference to artificial respiration, the administration of glucose and the administration of nitrites; the latter may act by producing carbon dioxide from the urea in the body and so stimulating the respiratory center.—M. E. D.

LABORATORY AIDS IN THE DIAGNOSIS OF LEAD POISONING. *A. R. Riddell. Canadian Pub. Health Jour., March, 1931, vol. 22, pp. 138–142.*

The author gives a very clear and succinct account of the dangers of exposure to lead, the various modes of its entrance into the body, and the laboratory tests that can be applied in the diagnosis of lead poisoning. Stress is laid upon the chemical examination of the urine as well as upon proper blood examination. Blood tests that can readily be made by the physician himself are discussed, and the detailed description of the method of staining blood smears to show stippling is described. The author points out the importance of periodic examination of blood smears of workers exposed to lead.—L. T. F.

SHADOWS PRODUCED BY LEAD IN ROENTGEN-RAY PICTURES OF GROWING SKELETON. *E. A. Park, D. Hackson, and L. Kajdi. Abstr. as follows from Am. Jour. Dis. Child., March, 1931, vol. 41, p. 485, in Jour. Am. Med. Assn., June 6, 1931, vol. 96, p. 1989.*

Park and associates state that, when taken for a sufficiently long period in sufficient dosage, lead apparently can produce changes in the bone in process of formation which are reflected in the roentgenograms as shadows of increased density. Like elementary phosphorus, lead can cloud bones in roentgenograms. The clouding is most conspicuous where growth is occurring most rapidly; namely, at the anterior ends of the middle six ribs, the lower ends of the femora, the upper end of the humerus, the lower ends of the radius and ulna, and at both ends of the fibula and tibia. In two cases observed by them in which the banding was most marked, only the ribs were studied with the roentgen ray; but in two other cases in which banding was well marked in the fast growing parts of the skeleton, it was not noted in the slow growing parts. That only those parts of the skeleton in process of growth at the time of ingestion of lead are affected is proved by the entirely normal structure of the old bone proximal to the lesions, the sharp limitation of the lesions to the growing parts, and a degree of involvement at any point exactly proportional to the rate of growth at that point. Obviously growth in any bone occurs in many places, but only where growth occurs rapidly do the changes readily reach such magnitude as to show in roentgenograms. The fact that only the bone in process of growth is affected must mean that the lead either enters into the chemical composition of the bone or influences cellular activity in such a way that the character of the bone formed becomes altered.

THE BEHAVIOR OF LEAD IN THE ANIMAL ORGANISM. II. TETRAETHYL LEAD. *R. A. Kehoe and F. Thamann. Am. Jour. Hyg., March, 1931, vol. 13, pp. 478–498.*

Experiments showed that tetraethyl lead is absorbed through the skin. Part of the tetraethyl lead is absorbed and circulates as such, but the greater part is decomposed by the tissues, resulting in a distribution of lead in the tissues, after from three to fourteen days, similar to that of water-soluble lead compounds. Even when absorbed as tetraethyl lead, the excretion is similar to that of water-soluble lead compounds, and tetraethyl lead poisoning is therefore not different from ordinary lead poisoning.—L. T. F.

THE RELATIVE TOXICITIES OF SOME ORGANIC SALTS OF TRIETHYL LEAD HYDROXIDE. *H. Gilman and O. M. Gruhzit. Abstr. as follows from Jour. Pharmacol. and Exper. Therap., 1931, vol. 41, pp. 1–4, in Chem. Abstr., May 20, 1931, vol. 25, p. 2485.*

The minimum lethal dose intravenously to rats, and the minimum lethal dose for the first three intramuscularly to rabbits are given for the following: triethyl lead salicylate, triethyl lead phenyl acetate, triethyl lead furoate, triethyl lead *p*-toluenesulphonate, triethyl lead *p*-aminobenzoate, triethyl lead furylacrylate. All the compounds were extremely irritating and produced nervous symptoms.—P. D.

STUDIES OF CALCIUM AND PHOSPHORUS METABOLISM. Xa. THE USE OF CALCIUM CHLORIDE TO RELIEVE PERISTALTIC PAIN. *W. Bauer, W. T. Salter, and J. C. Aub. Jour. Am. Med. Assn., April 11, 1931, vol. 96, pp. 1216–1217.*

1. The very slow, intravenous administration of 20 c.c. of a sterile solution of 5 per cent. calcium chloride promptly relieves the severe pain of colic caused by lead, or ureteral or biliary stone.

2. The relief afforded by such therapy is more rapid and more constant than that by other forms of treatment we have employed.—*Authors' Conclusions.*

CHRONIC MERCURY POISONING AMONG ATTENDANTS AT SHOOTING GALLERIES. *R. Garcin, J. Christophe, A. Bocage, and L. Hélion. Bull. et mém. Soc. méd. d. hôp., March 9, 1931, vol. 47, pp. 335–341.*

Details are given of three cases of mercury poisoning, with a full discussion of the symptoms observed among attendants at shooting galleries. The poisoning arises from fulminate of mercury used for charging the caps of cartridges. On a fête day 3,000 to 4,000 cartridges may be fired off in a confined space insufficiently ventilated, especially when tubes are used with targets at the far end. Dust containing mercury is plentiful in the booths and any rings worn become amalgamed. Apparently absorption occurs by inhalation. The symptoms experienced include muscular trembling and incoordination with scanning and explosive speech, diarrhea, and gingivitis with dark line on the gums, rhinitis, and conjunctivitis. This type of sickness is well recognized among the attendants themselves, although it has not previously been reported in the medical press.—E. L. C.

ACUTE MERCURY POISONING: REPORT OF TWENTY-ONE CASES WITH SUGGESTIONS FOR TREATMENT. *B. I. Johnstone. Canadian Med. Assn. Jour., April, 1931, vol. 24, pp. 500–507.*

1. Twenty-one consecutive patients with acute mercury poisoning are reported, and with these as a basis, the main clinical and pathologic features of this condition are discussed.

2. Treatment in the light of recent experimental work is outlined.

3. In view of the fact that at present prevention of absorption is more effective than any known therapeutic measure, transduodenal irrigation and biliary drainage are suggested as additional means of achieving this result.—*Author's Summary.*

INDUSTRIAL POISONING FROM OXALYL CHLORIDE. *H. Gerbis. Abstr. as follows from Zentralbl. f. Gewerbehyg., Oct., 1929, N. S. vol. 6, pp. 293–294, in Bull. Hyg., Feb., 1931, vol. 6, p. 144.*

Gerbis' observations relate to four workmen employed in the preparation of oxalyl chloride from oxalic acid and phosphorus oxychloride and pentachloride. Severe symptoms of cough and dyspnea supervened in all cases, lasting for from four to ten days. During the day the condition was hardly noticeable, but it came on violently at night with palpitation and feeling of intense anxiety.

The symptoms might be thought to be due to the ready decomposition of oxalyl chloride into carbon monoxide and phosgene:

$$\begin{matrix}\mathrm{COCl}\\ |\\ \mathrm{COCl}\end{matrix} = \mathrm{CO} + \mathrm{COCl_2}$$

The observations date back some years, but are brought forward now as a warning in view of certain valuable technical qualities which the substance is said to possess.—T. M. L.

ELIMINATION OF RADIUM SALTS FROM THE HUMAN BODY. PRELIMINARY REPORT. *F. B. Flinn. Jour. Am. Med. Assn., May 23, 1931, vol. 96, pp. 1763–1765.*

The author reports eight cases of radium poisoning in which radium elimination was increased following the administration of viosterol. Concurrently there was an improvement in bone condition. Elimination is very slow, but seems definite, and is suggested by the author as a means of treatment.—L. T. F.

THE CAUSES OF POISONING IN THE CLEANING OUT OF ACID EGGS OR TANK WAGONS WHICH HAVE CONTAINED SULPHURIC ACID. *Leymann and Weber. Abstr. as follows from Zentralbl. f. Gewerbehyg., June, 1930, N. S. vol. 7, pp. 154–159, in Bull. Hyg., Feb., 1931, vol. 6, p. 142.*

The authors describe nineteen instances of poisoning (most of them fatal) in the final stages of removal of residues, or mud, from sulphuric acid containers. The cases are extracted from reports of the German Factory Inspectors or of the Societies of Chemical Industries between 1888 and 1927. In carrying out this work, the vessels had to be entered generally through manholes, so that the work had to be done in a closely confined space, with a view to scraping off or digging up the mud at the bottom, with the help of shovels and buckets. In the accounts given, the opinion was that nitrous fumes accounted for four, arseniuretted hydrogen gas for seven, and nitrobenzene for one; in the remainder, "gas poisoning" alone was stated. The symptoms were inadequately reported (as might be expected in lay reports), most of the details relating only to description of the circumstances of the occurrences. In two fatal cases in which an autopsy was made, edema of the lungs was the principal postmortem finding and the cases were diagnosed as due to nitrous fumes.

The authors, however, believe that most, if not all, were due to the highly toxic gas arseniuretted hydrogen, produced in the nascent state by the reaction between the impure sulphuric acid and the metal spades and galvanized

iron buckets, either, or both, of which might contain arsenic.

If sulphuric acid containing nitric acid comes into contact with easily reducible substances or is warmed—as is the case when it is diluted with water—nitrous fumes will escape, but only in small quantity. The authors experimentally reproduced the conditions and concluded that (1) dilute crude sulphuric acid, in contact with iron in the presence of reducible arsenic compounds even at ordinary temperatures, can generate arseniuretted hydrogen; (2) very dilute sulphuric acid can generate arseniuretted hydrogen when the temperature is increased; (3) small amounts of nitric acid do not prevent the formation of arseniuretted hydrogen.

Arseniuretted hydrogen is about forty times as heavy as hydrogen and almost three times as heavy as air, and consequently will lie at the bottom of the vessels. The authors recommend that sulphuric acid eggs and tank wagons should be provided with cleaning openings at the bottom, and even then care must be taken, as arseniuretted hydrogen will escape from them and possibly also at the manhole.

[In order to prevent these occurrences in Great Britain, Reg. 9 (among others) of the Chemical Regulations prescribes "A sufficient supply of non-metallic spades, scrapers and pails shall be provided for the use of persons employed in cleaning out or removing the residues from any chamber, still, tank or other vessel which has contained sulphuric or hydrochloric acid or other substances which may cause evolution of arseniuretted hydrogen."] —T. M. L.

SUSCEPTIBILITY AND RESISTANCE TO TAR CANCER. *J. Maisin. Abstr. as follows from Ann. Surg., Jan., 1931, vol. 93, p. 180, in Arch. Dermat. and Syph., May, 1931, vol. 23, p. 964.*

From his experiments with mice, the author found that cancer caused by tar is the result of a local irritation plus a general intoxication. Magnesium and copper salts are capable of delaying the appearance of cancer and of lowering the percentage of induced tumors. Salts of radioactive metals have the opposite effect. A diet of liver activates the development of cancer caused by tar. Vitamin A, when absorbed, in addition to a normal alimentation, has no inhibitive effect on the appearance of cancer. Preceding the development of cancer caused by tar and during its evolution, the metabolism of fats is deficient and the variations of the cholesteremia are marked.

TAR CANCER IN APES. *C. Bonne, J. Lodder, and G. M. Streef. Abstr. as follows from Ztschr. f. Krebsforsch., 1930, vol. 32, p. 310, in Am. Jour. Cancer, April, 1931, vol. 15, pp. 898–899.*

Twenty apes were painted twice weekly on the back or abdomen with a gas tar from Amsterdam that was known to be carcinogenic for mice. After from six months to one and a half years, flat thickenings began to appear in the skin, which in some of the animals soon developed into ulcerating sessile papillomas with a diameter of from 5 to 15 mm. Microscopic examination showed the presence of pronounced epithelial invasion, and the effect of the tar was in general similar to that which it exerts on the skin of the mouse and the rabbit.

Yet these tar tumors did not become large metastasizing epitheliomas, as might have been expected; on the contrary, they had a tendency to spontaneous cure. This process the authors followed histologically, but they were unable to discover any characteristic features. Similar changes, they say, can be found in growing neoplasms of the human subject, for normal tumor growth always goes hand in hand with localized resorption, though growth eventually predominates. In these tumors of the ape, however, resorption overbalanced proliferation. As the same thing is true in the rabbit, it is evident that invasion, the criterion of malignancy in practical tumor diagnosis, has not the same grave significance in the tar tumors of the experimental laboratory.

TAR CANCER OF MICE: I. THE TECHNIQUE OF THE COMPARATIVE EXPERIMENT. *A. F. Watson and E. Mellanby. Abstr. as follows from Brit. Jour. Exper. Path., 1930, vol. 11, p. 267, in Am. Jour. Cancer, April, 1931, vol. 15, p. 897.*

In this preliminary paper Watson and Mellanby describe their program and discuss the effect of diet.

The ordinary methods of producing experimental tar cancer involve a technic so crude, the authors say, that it may conceal small though real variations. They therefore endeavored to institute a standard method, which it was hoped might expose any small differences in the effects of various experimental conditions on the initiation and growth of these neoplasms.

Young laboratory-bred mice of about the same age were tarred in as uniform a manner as possible, biweekly and usually no longer than for four months, as there is evidence to suggest that two or three months' treatment is more likely to expose differences in the reaction of the animals than a longer course of painting. For similar reasons, a tar of low carcinogenic activity seems preferable. All the conditions were kept as uniform as could be with the single exception of that one which was under examination at the time.

The first variable to be discussed is diet, which, the authors conclude, exerted no appreciable influence upon the manner in which the animals reacted to tar.

TAR CANCER IN MICE: II. THE CONDITION OF THE SKIN WHEN MODIFIED BY EXTERNAL TREATMENT OR DIET, AS A FACTOR IN INFLUENCING THE CANCEROUS REACTION. *A. F. Watson and E. Mellanby. Abstr. as follows from Brit. Jour. Exper. Path., 1930, vol. 11, p. 311, in Am. Jour. Cancer, April, 1931, vol. 15, p. 898.*

With few exceptions the general methods outlined in the preceding paper were employed. In this one the authors discuss treatment of the skin in various ways prior to the application of tar. Carcinogenic activity was increased when fluid fats or fatty substances were applied to the skin before tar painting was begun. A petroleum-ether extract of mouse tissues proved particularly effective. Carcinogenic activity was also increased in mice kept on a diet rich in butter. The coats of these animals assumed a characteristic fatty condition which probably facilitated

absorption of the tar. On the other hand, removal of fat from the skin by preliminary treatment with petroleum ether produced an opposite effect, the number of tumors being decreased.

As the authors point out, other investigators have obtained results directly contrary to those described in this paper.

FURTHER INVESTIGATIONS ON THE TREATMENT OF TAR TUMORS IN MICE WITH CERTAIN AMINO-ACIDS. *F. Vlès, A. de Coulon, and J.-L. Nicod. Abstr. as follows from Compt. rend. Acad. d. sc., 1930, vol. 191, p. 350, in Am. Jour. Cancer, April, 1931, vol. 15, p. 898.*

One hundred and seven mice with tar cancer (verified by biopsy) were given an equimolecular mixture of alanine, cystine, and proline by mouth, subcutaneously, or by both routes. The dose was 0.03 to 0.075 gm. daily. In twenty-six cases the tumor disappeared entirely; in thirty-seven there was partial regression; in nine the tumor continued to grow, and in thirty-five animals it remained stationary. This last group, however, contained a number of mice that died less than fifteen days after treatment was begun and before it had had time to exert its full effect. Among forty-two controls not a single case of regression had been discovered.

A mixture made up in the proportion of two molecules of d-glutamic acid to one of l-cystine promised to be even more successful. Among twenty mice treated, the carcinoma disappeared in ten and regressed partially in six more; three tumors continued to grow, and one remained stationary.

DUST HAZARDS AND THEIR EFFECTS

CONTRIVANCES FOR DUSTLESS FILLING AND PACKING OF DUST PRODUCING MATERIALS. *Beihefte z. Zentralbl. f. Gewerbehyg., no. 19, 1930, pp. 48. Reviewed as follows in Bull. Hyg., Nov., 1930, vol. 5, p. 897.*

This publication on a question of very great hygienic importance deals with the engineering side of the subject and as such is too technical to be of direct service to the medical officer of health. The author lays stress on the dual aspect of the problem: first, the importance of catching up the dust as soon as it is formed and rendering it innocuous; and secondly, the method of dealing with it afterwards. Naturally, the treatment will differ according to the industry, the nature of the dust, its quantity, and whether it is of sufficient commercial value to recover, or whether it has to be got rid of as a waste product. The work is amply illustrated both by photographs, and diagrams, all of which are well and clearly reproduced.—H. H. S.

RECENT VIEWS ON PNEUMONOCONIOSES. *E. L. Collis. Proc. Roy. Soc. Med., March, 1931, vol. 24, pp. 531–540 (Epidemiology and State Medicine, pp. 13–22). (Abstract by author.)*

This article presents a summary of work done with regard to dust diseases since the author's Milroy Lectures, 1915. Studies have shown that silicosis may be advanced without impairing health; but it may itself end fatally. Generally superimposed

tuberculosis hastens the termination. Such infection may precipitate latent fibrosis. Other dusts may set up fine, generalized fibrosis, seriously impairing the pulmonary functions, but not predisposing to tuberculosis. Asbestos is particularly injurious; other silicates, such as basalt, are harmful. Pure coal dust seems to be quite neutral; but raw coal often contains sufficient minerals to originate fibrosis; while fibrosis may so retain coal particles in the lungs as to block the lymph passages and impair function. Radiography displays the presence of fibrosis, but gives no clue to the causative factor. When silicosis is present the shadows tend to be nodular, superimposed upon pronounced arborization. Reference is made to recent mortality records associated with different dust hazards. Clinical and pathologic studies are summarized, which are concerned with dusts of iron ore, cement, coal, asbestos, and marble.

THE PRESENCE OF ASBESTOSIS BODIES IN THE FAECES IN A CASE OF PULMONARY ASBESTOSIS. *S. R. Gloyne. Tubercle, April, 1931, vol. 12, pp. 158–159.*

This short note describes how asbestos bodies in cases of pulmonary asbestosis may be found by emulsifying the feces in four to five times their volume of 5 per cent. formalin in saline and then centrifuging the product, which will be found to contain a scanty number. The bodies, which have probably been swallowed in sputum, show less than usual of the typical deep-yellow coloring matter, as though the pigment were partially destroyed by intestinal juices.—E. L. C.

SILICOSIS AND COAL-MINING. *J. S. Haldane. Tr. Inst. Min. Eng., 1931, vol. 80, p. 415.*

In earlier papers[1] the author concluded (*a*) that no danger to health would arise from stone dusting, provided suitable shale or other material was employed; and (*b*) that the unusually high bronchitis mortality rate among colliers in the higher age groups is due mainly to the strain on the lungs caused by muscular exertion. In the present paper Dr. Haldane reviews his conclusions in the light of the full data contained in the Registrar-General's Decennial Supplement for 1921 to 1923.

The phthisis death rates for the various groups of underground workers are distinctly lower than those for all occupied and retired civilian males. Even in that group engaged in making and repairing roads, which includes the work of ripping stone roofs and driving roads in stone, the death rate from phthisis at all ages above 25 is lower than for the standard population. It is mentioned, however, that in exceptional cases great risk may occur among men driving roads in highly silicious rock, particularly when machine drills are used. The Mines Act of 1911 required certain precautions in the use of these drills, but the clause was practically ignored. As a result, cases of silicosis have been discovered in the Somerset and South Wales coal fields.

The thesis is advanced that the inhalation of coal dust and shale dust, as among coal miners, coal boat loaders, or cement workers, stimulates

[1] The Effects of Dust Inhalation. Tr. Inst. Min. Eng., 1917–1918, vol. 55, p. 264.
The Health of Old Colliers. *Ibid.*, 1915–1916, vol. 51, p. 469.

the phagocytic activities of the lung, and thus confers a relative immunity from phthisis. As compared with coal, shale, or clay dust, the dusts of china clay, slate, and feldspar are very slowly eliminated, and it is suggested that this explains why neither the china clay used in potteries nor the feldspar in true granite protects against silica. Dr. Haldane dissents from the idea put forward at a recent Congress at Johannesburg, that the risk of silicosis is simply proportional to the proportion of free silica in the dust. Instead, he suggests that the action of free silica in paralyzing the phagocytes is commonly overcome by the action of other substances in eliminating them, but where these latter substances are absent or insufficient the silica action is predominant.

The view that the high bronchitis mortality is due to heavy muscular work is reasserted, although it is conceded that "it seems practically certain that excessive inhalation of coal-dust or shale-dust must cause bronchitis, and ought therefore to be avoided." In a subsequent discussion Professor E. L. Collis quoted comparative mortality figures for miners in different coal fields. It was shown that the comparative mortality from bronchitis in 1921 to 1923 for miners (hewers and getters) varied between the extremes of 33.8 for Leicestershire and 139.3 for South Wales, as compared with 49.6 for all occupied and retired males. It was suggested by Professor Collis that these differences hardly accord with differences in the work done, and do not support the muscular exertion theory of Dr. Haldane.—T. B.

Silica Content of Normal and of Tuberculous Lung. *R. Piazza. Riforma med., March 9, 1931, vol. 47, p. 369.*

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

Boils and Carbuncles among Miners. *S. W. Fisher. Lancet, April 4, 1931, vol. 1, pp. 750–751.*

The occurrence of boils among miners at one colliery led to an inquiry which covered forty-nine collieries; about 200 men were examined. The main factor in the causation of the boils was found to be a wet bulb temperature of 75°F. or over. At such temperatures the men work stripped, *i.e.*, wearing shorts and boots. Boils occurred more often on men who sweated profusely; their bodies were covered with a fine wet film of coal dust. The condition seems to be analogous to prickly heat and boils which occur in India in the rainy season. The fact that no men working in mines which had pithead baths were found to have boils, points to the value of cleanliness as a preventive measure. Some evidence of infection from man to man was found; cases followed one another in a given working stall. The offending organism was the staphylococcus, which under warm, moist conditions gained access to the open sweat glands and hair follicles.—E. L. C.

CHRYSANTHEMUM DERMATITIS. *G. S. Nightingale. Lancet, May 23, 1931, vol. 1, pp. 1132–1134.*

Details are given of a gardener who, in the course of his occupation, had to manipulate chrysanthemums every autumn. Gradually, as years passed by, he became more and more sensitized to the leaves. Now, whenever he handles chrysanthemum leaves, he suffers from a sharp local erythema which has an inclination to spread. Experimental application showed that the lower surface of the leaf gave a stronger reaction than the upper, and that a petal also gave a local erythema without vesiculation. The reaction appeared about twenty-four hours after exposure. The condition cleared up with rest and removal from exposure. The article contains information as to the possible factor at fault, which is thought to be pyrethrum, a natural ester. Extracts from chrysanthemums are used as insect powders, and the workers in the factories experience the dermatitis. Apparently the stronger smelling varieties of the plant are the most active.—E. L. C.

FORMALIN ECZEMA AMONG BOOKBINDERS. *G. Lutz. Abstr. as follows from Zentralbl. f. Gewerbehyg., Sept., 1930, N. S. vol. 7, pp. 266–268, in Bull. Hyg., April, 1931, vol. 6, p. 321.*

The author refers to numerous reports on cases of formalin dermatitis in medical literature, none of which mention the industry of bookbinding in which recently he has seen many cases.

The situation of the localized dermatitis was on the terminal phalanges of the first and second fingers, and spread somewhat from there. The nails in all cases were affected. Localization in this way was due to the manner of arranging the presses at exactly the same height; in order to do this, paper treated with a benzene containing wash was used. Recently, to this wash 0.5 per cent. formalin had been added. Healing took a long time and in one case no restoration of the skin to a normal condition could be expected.—T. M. L.

INDUSTRIAL INJURY OF THE SKIN FROM SALT. *S. Somogyi. Abstr. as follows from Dermat. Wchnschr., 1930, vol. 91, pp. 1691–1693, in Bull. Hyg., April, 1931, vol. 6, p. 322.*

The writer describes seven cases where dock laborers carrying sacks or bags of salt on their shoulders succumbed to extensive necrotic eruptions on the shoulders, neck, upper arms, and, in two cases, on the legs.

His explanation (and he refers to English literature in confirmation of it) is that it is due to the hygroscopic effect of the salt acting on the sweat, as most of the men worked with uncovered shoulders and in hot weather. —T. M. L.

WOOD-CUTTER'S ECZEMA. *W. Dubreuilh. Abstr. as follows from Ann. de dermat. et syph., Feb., 1931, vol. 2, p. 199, in Arch. Dermat. and Syph., June, 1931, vol. 23, p. 1107.*

Largin, in the *Annales* for February, 1929, reported eczematous eruptions in woodchoppers. Dubreuilh has also seen these eruptions and reports six cases. The eruption is caused by constituents of bark; planks and sawdust seem inoffensive. The majority of Dubreuilh's cases were due to oak.

It is not necessary that the wood be freshly cut—one patient was affected by wood cut a year previously—but moist wood is much more offensive than dry. Direct contact with the irritant is necessary to produce the eczema. As in rhus dermatitis, transfer to the other regions of the body occurs. Personal susceptibility, as in all eczemas, is a predominating factor. The eruptions in Dubreuilh's cases were mainly of the erythematosquamous type.

THE HYGIENE OF WOODWORKING. *G. Schmich. Abstr. as follows from Monatschr. f. Unfallheilk., 1930, vol. 37, pp. 21–24, in Bull. Hyg., April, 1931, vol. 6, p. 321.*

This is a discursive paper with notes particularly on the irritating action of teak dust. The author cites first experiments (by Hoffmann) on a number of men with sound skin, of whom only thirty-eight out of 100 remained free from the effects of teak meal on the skin. On persons with unhealthy skins the effect was more severe.

He states that the chemical constitution of the irritant substances is as yet unknown and that the irritation is stronger the fresher the wood and the finer the dust.

Actual observations in a large factory in which 616 teak woodworkers were employed showed only sixteen affected. The author found that sensitiveness varied greatly, and also the length of time between the first contact with the teak and the appearance of irritative signs.—T. M. L.

THE SLIT-LAMP IN THE DIAGNOSIS OF INTRAOCULAR FOREIGN BODIES. *R. Castroviejo. Abstr. as follows from Texas State Jour. Med., Oct., 1930, vol. 26, p. 428, in Am. Jour. Ophth., May, 1931, vol. 14, p. 476.*

Castroviejo gives a discussion of the etiology, mechanism, symptoms, lesions, and diagnosis in cases of intraocular foreign bodies. As part of the slit lamp examination the author calls attention to the use of the diaphragm of Lopez Lacarrère, or the double slit, in order to get two optic sections, a thick one and a thin one.

MAGNETIC INTRAOCULAR FOREIGN BODIES: LOCALIZATION AND REMOVAL WITH GIANT MAGNET. *J. W. Jervey. Abstr. as follows from South. Med. Jour., March, 1930, vol. 23, p. 89, in Am. Jour. Ophth., May, 1931, vol. 14, p. 476.*

In cases in which the Sweet localizer cannot be used for localization of foreign bodies in the eye, the author places two small Cushing wire brain clamps on the conjunctiva 3 mm. above and below the cornea in the vertical meridian. This gives two fixed points for localization. Anteroposterior and lateral pictures are then taken to determine the sector and the relative position of the foreign body in the sector. The eye must be kept in the primary position while the X-ray record is being taken, and a true anteroposterior and lateral view must be obtained, otherwise the error will be so great that the method will have little use.

CATARACT FROM MINUTE FOREIGN BODY. *P. Stoewer. Abstr. as follows from Ztschr. f. Augenh., Nov., 1930, vol. 72, p. 382, in Am. Jour. Ophth., May, 1931, vol. 14, p. 477.*

The author reports a case of bilateral cataract caused by the presence in the eye of pieces of stone so fine that the patient had not been aware of their entrance. The victim was a miller who chiseled his millstones without wearing goggles.

AN INVESTIGATION OF MINERS' NYSTAGMUS. *W. J. Roche. Brit. Jour. Ophth., April, 1931, vol. 15, pp. 211–244.*

Much information concerning miners' nystagmus, gathered from many sources, has been collected by the author around material relating to a series of 212 cases. A description is given of the disease as seen from the compensation viewpoint, stress being laid on the presence of giddiness in 80 per cent. of the incapacitated cases, which the author considers is the major symptom, with most of the others as secondary. He believes that some abnormality of the labyrinth is present in cases of nystagmus, but the evidence in favor is not entirely convincing. The view is held that the disease depends essentially upon dim illumination, which throws an undue strain upon the ocular muscles of accommodation and convergence. This strain is accentuated by the abnormal position taken up by the collier while undercutting coal, for the human being has not been evolved to do arduous work in abnormal positions (nevertheless, other men, such as road repairers, suffer from the disease). Certain recommendations are made, among which increased illumination stands first; for this purpose the use of a new 4 candle power alkali lamp is recommended.—E. L. C.

MINERS' NYSTAGMUS. *W. E. Cooke. Brit. Med. Jour., April 11, 1931, vol. 1, pp. 615–617.*

Dim illumination is accepted as the factor originating nystagmic movements among coal miners, a large number of whom exhibit such involuntary eye movements without being in any way inconvenienced. The author searches for some further factor which causes a latent condition of eye movements to become a manifest nystagmic disease. Close investigation was made of fifty-seven miners who had been certified as incapacitated from work because of the disease. Finally, the only other factor common to these men appeared to be some condition of toxemia, due, maybe, to pyorrhea, septic tonsils, purulent bronchitis, or other causes. These cases exhibited an abnormal polynuclear picture, wherein the count varied from a normal Arneth count; thus, whereas the normal polynuclear count for the five groups may be taken to be 10, 25, 47, 16, and 2, the average count in the nystagmus cases was 30, 39, 27, 4, and 0. The precipitation of nystagmus by disease or accident is held to result from the toxemia set up either by the infecting organism or by the tissues damaged by the trauma. Suggestions are also made with regard to the treatment of cases.—E. L. C.

INDUSTRIAL SURGERY

PHYSICAL THERAPY IN INDUSTRY. *C. H. Ogden. Arch. Physical Therapy, X-Ray, Radium, Feb., 1930, vol. 11, pp. 68–69.*

The author sketches the progress in the use of physical therapy in industry. Massage and hydrotherapy were the early forms of treatment, and service was practically limited to industrial hospitals. Following the War, the service was expanded to include muscle reeducation, vocational training, and rehabilitation; great strides were made in the electrotherapeutic field. Physical therapy is now practised not only in hospitals, but also in dispensaries and industrial surgeons' offices. It has as yet been impractical to establish vocational training or rehabilitation even in the largest industries except in certain individual cases but the author believes that this form of therapy is entirely practical in the larger cities with all the industries of the district to draw upon.

PHYSICAL AGENTS IN THE TREATMENT OF RAILWAY INJURIES. *F. H. Walke. Abstr. as follows from South. Med. Jour., Feb., 1930, vol. 23, p. 162, in Arch. Physical Therapy, X-Ray, Radium, March, 1931, vol. 12, p. 185.*

Strains, sprains, and contusions are treated with either heat or cold, while lacerations are first sterilized by ultraviolet light before surgery is attempted. Fractures and joint injuries are treated with splints, rest, diathermy, manipulation, and massage augmented by the sinusoidal and galvanic currents. Nerve injuries yield better to rest, heat; and the sinusoidal current. Burns of an extensive nature heal readily after light irradiation, but some are exposed to ultraviolet for its stimulating effect upon granulation tissue. Shock is admirably treated by diathermy through the splanchnic area, provided internal hemorrhage is excluded. Diathermy with the administration of an abundance of fluid is a valuable remedy for any surgical shock. Osteomyelitis is treated with diathermy and ultraviolet radiation after drainage has been established. Indolent ulcers are treated with radiant light, ultraviolet light, and galvanism. Infections subside more quickly if ultraviolet light and the high frequency current are used. Painful stumps are best treated by hydrotherapy and the application of mild Tesla sparks to the sensitive areas.

The results obtained through physical therapy are speedy, certain, and positive. Surgery can perform limited service only, and the surgeon's obligation does not stop with the healing of a wound, the uniting of a fracture, or the restoration of a nerve. It is his plain duty so to conduct the case that the patient may resume his usual vocation or else be fitted to do some form of profitable work. The injured must be put back to work after a minimum loss of time. Should permanent disability follow an accident, rehabilitation should be hastened so that living wages can be earned even if the original occupation is not resumed.

CONTRACTURES OF THE HAND. *S. L. Koch. Abstr. as follows from Surg. Gynec. Obst., Feb. 15, 1931, vol. 52, p. 367, in Jour. Am. Med. Assn., April 25, 1931, vol. 96, p. 1439.*

Koch emphasizes the importance of prevention of contractures of the hand. Contractures result from scar tissue formed after normal tissue has been destroyed; for example, after a burn or a crushing injury. It is formed as a diffuse inflammatory process, such as a cellulitis of the hand or a tendon sheath infection, subsides; it is formed if only tissues which normally are subject to free and constant movement are kept immobilized for more than three or four days. Familiar examples are the fibrosis that develops in fingers which are fixed in extension because of a fractured phalanx or metacarpal, or the fibrosis that develops—perhaps not quite so promptly—about any joint that is immobilized because of a fracture in its vicinity. With these causes of fibrosis and scar tissue formation in mind one may formulate a few principles of importance in prevention: first, not to wait for large raw surfaces, which result from burns and crushing injuries, to heal spontaneously. If such surfaces are covered at the earliest possible moment with skin grafts, time is saved for the patient, the constant danger of reinfection is eliminated, and the formation of scar tissue is reduced to a minimum. A second important principle in prevention, and one that can scarcely be overemphasized, is early mobilization. If fibrosis can develop after simple fractures when no infection is present, it is obvious that the presence of an inflammatory exudate hastens and accentuates the process, and that in the treatment of a hand infection early mobilization is an important feature of adequate surgical care if contractures are to be prevented. When contractures have already developed, the treatment varies with the anatomic structures involved. There may be involvement of skin and subcutaneous tissue only, of tendons alone, of the median and ulnar nerves, of joints of fingers, hand or wrist, or of several or all of these structures. For contractures due to loss of skin and subcutaneous tissue, the author has invariably resorted to some form of skin grafting to replace the lost tissue. For contractures of the palm, he has come to use in the majority of cases the free full thickness graft. For contractures due to firm scar tissue between the thumb and index finger and contractures involving the dorsum of the hand alone, the tubed flap affords a highly satisfactory method of securing a covering of normal tissue. For contractures involving the dorsum of fingers as well as the hand, a pocket flap on the abdomen or the thigh is useful.—C. K. D.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

VITAL-CAPACITY STUDIES AMONG FILIPINOS. VITAL-CAPACITY STANDARDS FOR MEN FROM 15 TO 30 YEARS OF AGE. *N. Cordero and M. Ocampo. Philippine Jour. Sc., March, 1931, vol. 44, pp. 325–335.*

1. The vital capacities of 2,600 male university students from 15 to 30 years of age are analyzed, and two prediction standards are prepared; one is based on standing height, and the other is based on the product obtained by multiplying the height in centimeters by the weight in kilograms.

2. The Ht x Wt standard is considered the better of the two. It is also shown that this standard is better than the surface-area standard when applied both to Filipino and American men.

3. The average vital capacity of Filipinos, expressed in liters per square meter of body surface, is 2, the same as that of male Chinese, lower than that of American men (2.5), and equivalent only to the vital capacity of American women.—*Authors' Summary.*

THE MECHANICAL EFFICIENCY DURING EXERCISE. THE PHYSIOLOGY OF THE METABOLIC CHANGES. *E. Simonson and H. Hebestreit. Abstr. as follows from Pflüger's Arch. f. d. ges. Physiol., 1930, vol. 4, pp. 498–531, in Physiol. Abstr., April, 1931, vol. 16, p. 51.*

The changes during and after exercise are much more complicated than is suggested in the simple scheme of Hill. The efficiency increases during exercise and especially during short periods of exercise. This increase is at first rapid, gradually falls off, but can still be demonstrated after six to ten minutes. With longer periods of work, the efficiency decreases. This is due to fatigue. It is suggested that more metabolites are produced during an initial short period of work than in the ensuing period, thus explaining the increase in efficiency. There is no definite relationship between the "recovery residue" and the rise in oxygen consumption. The "recovery residue" shows a maximum at three or six minutes. If periods of exercise alternate with short periods of rest, the efficiency increases with successive periods of exercise. If the period of rest is of the order of thirty minutes, there is no effect on the following period of exercise. The efficiency values obtained at the height of the "steady state" are lower than those obtained for the whole period of exercise and recovery. The rise in efficiency during work is more marked when the *tempo* of the work is rapid.

STUDIES IN THE PHYSIOLOGY OF EXERCISE. IV. FURTHER CONCERNING EXERCISE AND BASAL METABOLISM IN DOGS. *A. H. Steinhaus and T. A. Jenkins. Abstr. as follows from Am. Jour. Physiol., 1930, vol. 95, pp. 202–210, in Physiol. Abstr., April, 1931, vol. 16, p. 51.*

A period of training sufficient to put the musculature and the entire organism into excellent physical condition for strenuous work is without influence on the basal metabolism either within the training period or in the subsequent post-training period.

INDUSTRIAL ENVIRONMENTAL CONDITIONS

THERMAL EXCHANGES BETWEEN THE BODIES OF MEN WORKING AND THE ATMOSPHERIC ENVIRONMENT. *F. C. Houghten, W. W. Teague, W. E. Miller, and W. P. Yant. Am. Jour. Hyg., March, 1931, vol. 13, pp. 415–431.*

A series of work tests were made on four normal male subjects at effective temperatures of −2° to 32.6°C. and relative humidities of 20 and 95 per cent. All the subjects were normally clothed and had previously partaken of their regular diet. The work was

performed on a special work machine and in the majority of the tests the rate was 4,578 kgm. per hour. However, a few tests were made at half, and a few at double this rate. A special test is reported showing the increase in metabolic rates for different states of activity. The efficiency of the human body as an engine is shown to vary from 11 to 20 per cent. in performing this type of work. Metabolic processes as measured by gaseous exchange reach equilibrium very quickly after changes in state of activity.

A minimum energy production or metabolic rate of 119 calories per square meter per hour was found for men working at a rate of 4,578 kgm. per hour in the temperature range 6° to 24°C. effective temperature. Energy production within, and total heat loss from the body, are shown to be functions of the effective temperature index for men normally clothed, working. Total heat loss is divided into loss by evaporation and combined loss by radiation and convection, both of which are shown to be functions of dry bulb temperature. All curves for working men show similar characteristics to those for men seated at rest[1]; but are of greater magnitude, the points of change occurring at lower temperatures for men working.

Excessive heat produced in the body due to work is shown to be dissipated largely by increased evaporation controlled by the availability of perspiration. Change from insensible to sensible perspiration takes place at 10° and 13.9°C. effective temperature with 95 and 20 per cent. relative humidity respectively.—*Authors' Summary.*

[1] Houghten, F. C., Teague, W. W., Miller, W. E., and Yant, W. P.: Thermal Exchanges between the Human Body and its Atmospheric Environment. Am. Jour. Physiol., 1929, vol. 88, pp. 386–406; THIS JOUR., 1930, vol. 12, Abstr. Section, pp. 80–81.

THE EFFECT OF VARIATIONS IN RELATIVE HUMIDITY UPON SKIN TEMPERATURE AND SENSE OF COMFORT. *U. Miura. Am. Jour. Hyg., March, 1931, vol. 13, pp. 432–459.*

1. The skin temperature of the forehead and over the carotid of a man, normally clothed and sitting in still air, tends to vary directly with the relative humidity of the air at temperatures between 60° to 80°F., although the variation is small. The rate of variation is larger at 70° and 80°F. than at 61° to 62°F. The variation for a difference of 50 per cent. in relative humidity observed with four subjects and the investigator, averages 0.3°C. on the forehead and 0.2°C. over the carotid at 70°F. dry bulb temperature, 0.2°C. on the forehead and 0.1°C. over the carotid at 61° to 62°F. dry bulb temperature.

2. The sense of warmth of a man, normally clothed and sitting in still air, tends to vary with the relative humidity at dry bulb temperatures between 60° to 80°F.; and the rate of variation increases with a rise in the dry bulb temperature. This relationship coincides with the effect of humidity upon skin temperature. A difference of 50 per cent. in relative humidity is evidently perceptible for ordinary persons at dry bulb temperatures between 70° to 80°F. under the conditions stated above. A difference of 20 per cent. in relative humidity at

70°F. and a difference of 50 per cent. at 61° to 62°F. are probably beyond the power of perception.

3. The effect of relative humidity upon the sense of warmth is in accordance with the effective temperature concept for dry bulb temperatures between 60° to 80°F. The magnitude of the effect obtained on the average for the four subjects and the investigator was somewhat less than would have been expected from Yaglou's thermometric chart. A difference of 50 per cent. relative humidity corresponded in its effect upon the sense of warmth with a difference of 1.7°F. in dry bulb temperature at 61° to 62°F. at a constant relative humidity, and to a difference of 4°F. at 70°F. The rates calculated from Yaglou's thermometric chart are 2.5°F. at 61°F., and 4.6°F. at 70°F. on the average for different humidities.

4. Relative humidities of 70 per cent. and above cause an uncomfortable feeling of wetness at 70°F.—*Author's Conclusions.*

WORK IN HOT TUBULAR BOILERS. *M. Van Themsche and P. Wautriche. Ann. d'hyg. pub., indust. et sociale, March, 1931, vol. 9, pp. 117–144.*

A description is given of work in repairing tubular boilers, which are seldom allowed to cool down before the repair is executed. The men prefer working after the temperature has fallen to 45°C. or below. Work at a temperature as high as 60°C. should not be undertaken. If the temperature is over 45°C. the spell during which work can be carried on is shorter, varying from eleven minutes for a first entry into the boiler to eight minutes for a second entry, to six minutes for a third, and to three minutes for a fourth; on the other hand, with the temperatures below 45°C., the periods were found to be seventeen minutes for a first entry, fifteen for a second, and fourteen for a third. The work has to be done with exposure to dry heat; it throws a strain upon the circulation to enable the body to cast out moisture by means of the skin and the lungs, in order to keep down the temperature. This strain leads finally to feebleness of the heart, and to pulmonary emphysema.

Six men were clinically observed before, during, and after work; the observations made are given in detail. The conclusion drawn is that this type of work imposes stress on the cardiac muscle, which, after years, becomes enfeebled. The right side of the heart in particular feels the strain, owing to the part played by the lungs in deep and frequent breathing to get rid of moisture by the expired air.—E. L. C.

VENTILATION IN COMMERCIAL GARAGES AND SERVICE STATIONS. *M. R. Mayers. Abstr. as follows from N. Y. State Dept. Labor, Indust. Hyg. Bull., Nov., 1930, vol. 7, pp. 17–19, in Bull. Hyg., April, 1931, vol. 6, pp. 317–318.*

This article discusses the danger of carbon monoxide in the air of garages, which may contain as much as 11 parts per 10,000 just opposite the exhaust pipes of cars having their engines run during tests while under repair. Owing to its weight being so little more than that of air, the carbon monoxide diffuses while rising slowly toward the roof and thus contaminating the human respiration zone.

Experiments with engines run in a garage are quoted as giving the results shown in Table 1. These results indicate that safety may be assured to garage employees by discharging the exhaust fumes above head level and beneath an extracting ventilator, or by powerful suction applied at their usual discharge level from horizontal exhaust pipes just above the floor. Since the latter is difficult, the former is recommended by three methods: (*a*) making car exhaust pipes vertical, with exit above car roof (and beneath an extraction ventilator in the garage roof); (*b*) fitting similar vertical shafts to the orifices of horizontal exhaust pipes while cars are being tested in garages; (*c*) making a system of collecting pipes around the garage wall, with an exit above the garage roof, and junctions which can be attached by flexible tubes to the exhaust pipes of cars during tests within the garage.

TABLE 1

CAR EXHAUST	ENGINE RUN FOR	CO PER 10,000 PARTS IN SAMPLE TAKEN AT HEIGHT ABOVE FLOOR		VENTILATOR IN ROOF
		5 Ft.	7 Ft.	
	min.			
Horizontal ..	5	7·3	7·0	Not working.
	10	9·2	7·4	Working.
Vertical	5	4·2	16·4	Not working.
	10	2·0	3·5	Working.

By such means the carbon monoxide in garages may be kept below the toxic level of 1 part per 10,000.—P. S. L.

RECENT PROGRESS IN AIR CONDITIONING. *W. H. Carrier. Abstr. as follows from Refrigerating Engin., 1931, vol. 21, pp. 187–189, in Chem. Abstr., May 20, 1931, vol. 25, p. 2503.*

Air conditioning is discussed in relation to the comfort of the individual, fields of application, and mechanical and engineering requirements.—P. D.

INDUSTRIAL PSYCHOLOGY AND INDUSTRIAL MANAGEMENT IN ITS HEALTH RELATIONS

NOISE AND ITS INFLUENCE, FROM THE VIEWPOINTS OF INCONVENIENCE, HEALTH, AND THE PRODUCTIVE CAPACITY OF WORKERS. *P. Boulin. Abstr. as follows from Ann. d'hyg. pub., indust. et sociale, 1930, vol. 8, pp. 645–651, in Bull. Hyg., Feb., 1931, vol. 6, p. 134.*

Certain investigations into the influence of noise upon work, especially some made in America, are summarized. Noise lowered from an intensity of 45 to one of 35 was associated with a 12 per cent. increase in production. In another case, moving workshops to a quieter position reduced defective output from 75 per cent. to 7 per cent., while output increased from 80 to 110 per cent. A reduction in noise from an intensity of 50 to one of 35 lowered mistakes made in telegraphy by 42 per cent. Other instances are quoted in which the work of typewriting was benefited by a reduction in noise; but here, although a reduction from an intensity of 55 to

one of 43 was beneficial, a further reduction from 43 to 15 gave no particular advantage. Intensity of sound was measured in "décibel," which is defined as the least change in the tonality of a sound which can be detected by the ear. In factories the intensity varies from about 85 to 100. In a third-story room sounds coming from the street have an intensity of 10 to 20 units less than those in the street, and from 15 to 30 units less when the windows are closed. The inconvenience experienced from noise is a function of both loudness and frequency. Intense sound waves of short duration are more troublesome than less intense waves of more prolonged duration; and high frequency is more disagreeable than high intensity. Mice kept in ordinary cages exposed to sound vibrations did not thrive so well as others. A campaign against noise has been set on foot in Germany, particularly in the textile industry.—E. L. C.

INDUSTRIAL SERVICE AND MUTUAL BENEFIT ASSOCIATIONS

WELFARE AND WELFARE SUPERVISION IN FACTORIES. *Welfare Pamphlet No. 3, pp. 25. Second edition. H. M. Stationery Office, 1931.*

The Home Office has issued a second edition of the Welfare Pamphlet which first appeared in 1919. The present issue has been enlarged and partly rewritten; it is better printed, and contains useful illustrations. The subject matter is divided into four headings, which are concerned with fitting the work to the worker, with fitting the worker to the work, with welfare outside the factory, and, lastly, with the organization of welfare work. No attempt is made to deal with the subject at length; but the case is presented that attention to details under each of the subjects discussed is of economic value, since it improves production and increases contentment. Rather more emphasis than usual is laid on the need for employment managers or welfare supervisors to take charge of the manifold matters concerned with the personality of the workers. Such officers should be given a thorough training before they embark upon their task. The present pamphlet indicates that considerable advance has been taking place in industrial welfare since its predecessor was issued.—E. L. C.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

THE REFRACTORY MATERIALS REGULATIONS, 1931, DATED APRIL 28, 1931, MADE BY THE SECRETARY OF STATE UNDER SECTION 79 OF THE FACTORY AND WORKSHOP ACT, 1901. *Reprinted from Statutory Rules and Orders, 1931, No. 359. H. M. Stationery Office, 1931, pp. 4.*

In pursuance of Section 79 of the Factory and Workshop Act, 1901, I hereby make the following Regulations and direct that they shall apply to all factories and workshops, or parts thereof, in which are carried on any of the following processes:

1. The handling, moving, breaking,

crushing, grinding or sieving of any refractory material containing not less than 80 per cent. total silica[1] for the purposes of the manufacture (*a*) of articles used in the construction of furnaces and flues; (*b*) of crucibles; and (*c*) of compositions or other materials used in the preparation of molds in which metals are cast; or

2. Any processes in the manufacture of silica bricks as hereinafter defined.

Provided that nothing in these Regulations shall apply (*a*) to the handling, moving, mixing or sieving of natural sands; or (*b*) to the manipulation of rotten rock in the preparation of molds used in metal foundries.

Provided further that if the Chief Inspector of Factories is satisfied in respect of any factory or workshop or part thereof that, owing to the special conditions of the work or otherwise, any of the requirements of these Regulations can be suspended or relaxed without danger to the health of the persons employed therein, he may by certificate in writing authorize such suspension or relaxation for such period and on such conditions as he may think fit. Any such certificate may be revoked at any time.

These Regulations may be cited as "The Refractory Materials Regulations, 1931," and shall come into force on July 1, 1931. From that date the Regulations dated April 26, 1919, for the crushing, grinding, and sieving of refractory materials and other processes involving manipulation of such materials shall be revoked.

Definitions[2]

In these Regulations:

Refractory material means refractory material containing not less than 80 per cent. total silica (SiO_2).

Silica brick means any brick or other article composed of *refractory material* and containing not less than 80 per cent. total silica (SiO_2).

Duties

It shall be the duty of the occupier to observe Part I of these Regulations.

It shall be the duty of every person employed to observe Part II of these Regulations.

PART I

Duties of Occupiers

1. No *refractory material* shall be broken in pieces by manual labor unless the process is carried out in the open air.

2. No *refractory material*, unless it is so wet that dust will not be produced, shall be crushed or ground in a stone crushing machine or a grinding machine unless such machine is provided with (*a*) an efficient exhaust draft and efficient dust collecting appliances; or (*b*) an efficient water or steam spray; and the arrangements shall not be deemed to be efficient unless they are adequate to prevent the escape of dust into the air in or near to any place in which any person is employed.

[1] The limit of 80 per cent. total silica here fixed is *not* intended as a danger limit, suggesting that a lower percentage would not be harmful. It is fixed in order to delimit the application of the Code of Regulations to one class of refractory materials. By this limit the fireclay industry, in which silicosis is not known to occur, is not brought within the application of the Code. On the other hand the granite industry, with about one-third only of free silica, is recognized to be harmful.—*Ed.*

[2] Terms to which defined meanings are given are printed throughout in italics.

3. All chutes, conveyors, elevators, screens, sieves, and mixers used for manipulating *refractory material* shall, unless the material is so wet that dust will not be produced, be enclosed and be provided with an efficient exhaust draft so arranged as to prevent the escape of dust into the air in or near to any place in which any person is employed.

4. No *refractory material* so dry as to produce dust shall:

a. Be loaded into any wagon or other receptacle for transport unless it has been placed in a suitable dust proof container or so damped as to preclude dust; or

b. Be unloaded from any wagon or other receptacle for transport unless it has been so damped as to preclude dust or unless the work is done under an efficient exhaust draft so arranged as to prevent the escape of dust into the air; or

c. Be shoveled or raked or otherwise manipulated by means of hand tools in any manufacturing process unless it has been so damped as to preclude dust or unless the work is done under an efficient exhaust draft so arranged as to prevent the escape of dust into the air.

Provided that paragraph *b* of this Regulation shall not apply to *refractory material* in the form of rock or pebbles before it is manipulated in any manufacturing process.

5. The floors of all places where *silica bricks* are dried, other than the floors of tunnel ovens or chamber driers not normally entered by persons employed, shall, after each lot of *silica bricks* has been removed, be carefully cleaned of all débris and the part being cleaned shall be kept damp while the cleaning is being done.

For the purposes of this Regulation there shall be provided in every such place a constant supply of water laid on under adequate pressure with sufficient connections and a flexible branch pipe and sprinkler to enable water to be supplied direct to every part of the floor.

6. No drying stoves in which *silica bricks* are baked by fires before being placed in the kilns shall be used.

7. The surface of every floor or place where persons are liable to pass shall be cleaned of débris of *refractory material* once at least during each daily period of employment or, where shifts are worked, once during each shift. Such débris unless it is immediately required for use in the processes, shall be effectively damped and either be placed in covered receptacles, or be otherwise stored in such a manner as to prevent the escape of dust into the air in or near to any place where any person is employed.

8. Where plates are used, whether portable or forming part of the floor, on which *silica bricks* are dried, such plates shall be freed from adherent material only by a wet method or by such other method as will prevent the escape of dust into the air.

9. The dust or powder of *refractory material* shall not be used for sprinkling the molds in *silica brick* making.

Provided that nothing in this Regulation shall be deemed to prevent the use of natural sand for the purpose of sprinkling the molds.

Part II

Duties of Persons Employed

10. Every person employed shall make full and proper use of the appliances provided for any of the purposes of these Regulations.

11. No person shall misuse or, without the concurrence of the occupier or manager, in any way interfere with any appliance provided in pursuance of these Regulations.

IMPORTANCE OF VISUAL FIELD STUDIES AFTER HEAD INJURIES. *C. J. McCullough. Abstr. as follows from Pennsylvania Med. Jour., Aug., 1930, vol. 33, p. 733, in Am. Jour. Ophth., May, 1931, vol. 14, p. 477.*

McCullough states that disturbances of the visual pathways after head trauma may be due to (1) traumatic cerebral edema, (2) contusion or laceration of tissues, (3) retinal edema, (4) intracerebral, subdural, or extradural hemorrhage, or (5) sequelae such as brain cyst, brain abscess, or arteriovenous aneurism.

The author concludes that the ophthalmologist should be in daily attendance on all cases of head injury and should make frequent examinations of the visual fields. Ten cases are reported to indicate the degree and frequency of visual field loss after head injury. Industrial insurance is an important aspect of the problem in five of these cases.

INDUSTRIAL MORTALITY AND MORBIDITY STATISTICS

SICKNESS AMONG INDUSTRIAL EMPLOYEES IN THE SECOND HALF OF 1930. *Reprinted from U. S. Pub. Health Rep., April 3, 1931, vol. 46, pp. 765–767.*

A favorable health record among industrial workers during the second half of 1930 is indicated from reports of a group of industrial sick benefit associations covering about 135,000 male industrial employees. The record is based on the frequency of claims for sickness and nonindustrial accident benefits covering cases causing disability for eight consecutive calendar days or longer. A low rate of cases causing more than one week's disability was recorded also for male employees of the same industrial establishments in the first and second quarters of 1930.[1]

Although available morbidity rates are based on sample data that may be too small to be representative, favorable mortality rates in 1930 suggest that the relatively low incidence rates of disabling sickness among the men included in the record under discussion may have prevailed generally. The death rate among about nineteen million industrial policyholders of the Metropolitan Life Insurance Company is reported as being about 1 per cent. less than in 1927, when the previous minimum death rate was established.[2] Among the sixty-odd thousand members of the Relief Plan of the Bethlehem Steel Corporation, both mortality and morbidity in 1930 were substantially below the average during prior years.[3] The data available seem to indicate that the year as a whole was marked by relatively good health among the wage earning population of the United States.

That the favorable sickness record

[1] *Cf.* Sickness among Industrial Employees in the First Half of 1930. U. S. Pub. Health Rep., 1930, vol. 45, p. 2611. (Reprint No. 1420.)

[2] Statistical Bulletin, Metropolitan Life Insurance Co., Jan., 1931, vol. 12, p. 1.

[3] Fifth Annual Report of Relief Plan of Bethlehem Steel Corporation and Subsidiary Companies, p. 8.

TABLE 1.—FREQUENCY OF DISABILITY LASTING EIGHT CALENDAR DAYS OR LONGER IN THE THIRD AND FOURTH QUARTERS OF 1930 COMPARED WITH THE CORRESPONDING QUARTERS OF 1929 AND 1928—MALE MORBIDITY EXPERIENCE OF SEVENTEEN INDUSTRIAL ESTABLISHMENTS WHICH REPORTED THEIR CASES TO THE UNITED STATES PUBLIC HEALTH SERVICE DURING ALL THREE YEARS[1]

DISEASES CAUSING DISABILITY[2]	ANNUAL NO. OF DISABILITIES PER 1,000 MEN		
	1930	1929	1928
Third Quarter (July, August, September)			
Sickness and nonindustrial injuries	78.2	88.2	84.1
Nonindustrial injuries	12.5	13.3	11.1
Sickness	65.7	74.9	73.0
Respiratory diseases	17.2	23.3	25.0
Influenza and grip (11)	4.2	6.8	9.1
Bronchitis, acute and chronic (99)	2.9	3.4	3.8
Pneumonia, all forms (100, 101)	1.2	1.5	1.2
Diseases of the pharynx and tonsils (109)	4.5	5.8	5.1
Tuberculosis of the respiratory system (31)	0.9	1.1	0.9
Other respiratory diseases (97, 98, 102–107)	3.5	4.7	4.9
Nonrespiratory diseases	48.5	51.6	48.0
Diseases of the stomach, diarrhea, and enteritis (111, 112, 114)	6.8	6.9	5.7
Other diseases of the digestive system (108, 110, 115–127)	8.2	10.1	8.9
Diseases of the circulatory and genito-urinary systems and annexa (87–96, 128–136)	7.1	8.2	6.5
Diseases of the nervous system (70–84)	5.0	5.0	4.7
Diseases of the skin (151–154)	4.6	4.8	5.4
Epidemic and endemic diseases except influenza (1–10, 12–25)	1.4	1.2	0.9
Rheumatism—acute and chronic (51, 52)	4.5	4.4	6.0
Lumbago and other diseases of the organs of locomotion (158)	3.5	3.7	3.4
Ill-defined and unknown causes (205)	2.3	2.0	1.8
All other diseases (26–30, 32–37, 41–50, 53–69, 85, 86, 155–157, 159, 164)	5.1	5.3	4.7
Average number of males covered in the records	137,730	143,344	116,985
Fourth Quarter (October, November, December)			
Sickness and nonindustrial injuries	84.5	96.0	130.0
Nonindustrial injuries	12.2	12.7	11.4
Sickness	72.3	83.3	118.6
Respiratory diseases	26.0	37.4	69.2
Influenza and grip (11)	10.7	15.1	45.4
Bronchitis, acute and chronic (99)	4.2	6.5	6.7
Pneumonia, all forms (100, 101)	2.0	2.9	3.9
Diseases of the pharynx and tonsils (109)	4.1	6.9	5.9
Tuberculosis of the respiratory system (31)	0.7	1.0	0.9
Other respiratory diseases (97, 98, 102–107)	4.3	5.0	6.4

TABLE 1.—*Concluded*

DISEASES CAUSING DISABILITY[2]	ANNUAL NO. OF DISABILITIES PER 1,000 MEN		
	1930	1929	1928
Fourth Quarter (October, November, December)—Concluded			
Nonrespiratory diseases	46.3	45.9	49.4
Diseases of the stomach, diarrhea, and enteritis (111, 112, 114)	5.5	5.0	6.1
Other diseases of the digestive system (108, 110, 115–127)	8.1	7.3	7.2
Diseases of the circulatory and genito-urinary systems and annexa (87–96, 128–136)	7.8	7.3	8.0
Diseases of the nervous system (70–84)	4.3	5.4	5.3
Diseases of the skin (151–154)	3.8	3.8	4.7
Epidemic and endemic diseases except influenza (1–10, 12–25)	1.9	1.9	1.2
Rheumatism—acute and chronic (51, 52)	5.1	4.6	4.9
Lumbago and other diseases of the organs of locomotion (158)	3.2	4.3	5.1
Ill-defined and unknown causes (205)	1.6	1.7	2.0
All other diseases (26–30, 32–37, 41–50, 53–69, 85, 86, 155–157, 159, 164)	5.0	4.6	4.9
Average number of males covered in the records	131,673	140,007	119,452

[1] Except that the rate for 1928 covers sixteen of the seventeen establishments included in 1929 and 1930.

[2] Numbers in parenthesis are disease title numbers from the International List of the Causes of Death, third revision, Paris, 1920.

was due largely to the absence of serious epidemics of a respiratory nature is indicated by the nonrespiratory disease rate, which differed little in 1930 from that of 1929 and 1928. In contrast, the incidence of influenza or grip was much lower in three of the four quarters of 1930 than in the corresponding periods of the two immediately preceding years. The frequency of cases of pneumonia also was relatively low throughout the year 1930. The death rate from influenza among industrial policyholders of the Metropolitan Life Insurance Company was lower in 1930 than for any other year, with a single exception, since the great pandemic of 1918 to 1919. The mortality rate for influenza and pneumonia combined was the smallest ever experienced among these millions of insured persons, as was the 1930 rate for pneumonia separately.[4] It will be recalled that the recent mild wave of influenza did not get under way until January, 1931.

An unusually low rate was established not only for influenza and pneumonia, especially in the second half of 1930, but also for other diseases of the respiratory system. The rates for bronchitis (acute and chronic) and for pharyngitis, tonsillitis, and other diseases of the pharynx were unusually low as may be seen from the comparisons afforded in Table 1. The diseases

[4] Statistical Bulletin, Metropolitan Life Insurance Co., Jan., 1931, vol. 12, p. 4.

included in the category "other respiratory diseases" were also conspicuous by their infrequency. The low rate of new cases of tuberculosis of the respiratory system shown in the fourth quarter of 1930 may be revised upward if later reports change to a diagnosis of tuberculosis certain cases which at present are classified among the less serious respiratory diseases. There is little likelihood, however, that the indicated rate of new cases of tuberculosis in the third quarter of 1930 will be appreciably altered. In general, it may be said that all the numerically important respiratory diseases appear to have occurred at below average incidence in this industrial group during the last six months of 1930.

In spite of unusually hot weather in the third quarter of 1930 (July, August, September), the frequency of eight-day and longer cases of diseases of the stomach, diarrhea, and enteritis was not abnormally high. The only non-respiratory disease group shown in Table 1, which exhibited signs of increased prevalence in the summer of 1930 was the epidemic and endemic disease group, exclusive of influenza. This group covers titles numbered 1 to 10 and 12 to 25 in the International List of the Causes of Death, 1920 revision.

As has been indicated, the morbidity rates presented in Table 1 cover a very small sample of the wage earning population of the country. However, comparisons of recent with earlier periods were made among men in the same industrial establishments, so that the same population, as near as it was possible to obtain, was under observation.

The establishments included were (with one exception) located north of the Ohio and Potomac Rivers and east of the Mississippi. The sickness rates for female employees are not presented on account of paucity of data.

PREVALENCE OF UNSUSPECTED DISEASE IN INDUSTRIAL WORKERS. *T. L. Squier. Wisconsin Med. Jour., March, 1931, vol. 30, p. 167.*

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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GENERAL

REFLECTIONS ON CERTAIN PROBLEMS OF INDUSTRIAL MEDICINE. *L. Carozzi. Abstr. as follows from Arch. f. Gewerbepath. u. Gewerbehyg., 1930, vol. 1, pp. 52–66, in Bull. Hyg., May, 1931, vol. 6, p. 402.*

An interesting review is presented from an international outlook by one who watches progress from a detached position at Geneva. Today knowledge spreads rapidly from country to country, notwithstanding the handicap of languages. No longer is industrial medicine restricted to a few occupational diseases; it now includes industrial physiology and psychology, the environment of work, and methods of production. Dangers, like tetraethyl lead and radioactive paints, recognized in one country, are followed up in others; steadily the standard of factory hygiene is being raised by international influence. Industrial evidence may give inestimable help to medical science, as in the instance of carcinogenic substances and occupational cancers of the skin, lungs, and bladder. The study of dermatitis is increasing understanding of defense and immunization processes, of personal diathesis and exogenous agents. Research into activity and fatigue, opened in Italy by Mosso, is being pursued in England, America, Russia, and Germany. As information is accepted, international legislation to give it practical value is inaugurated from Geneva, of which medical supervision in injurious industries and the granting of compensation for occupational diseases are

examples. Spray painting is an instance of a new risk which is being met internationally; metallization is another.—E. L. C.

OBSERVATIONS ON INDUSTRIAL HYGIENE. *A. J. Lanza. Am. Jour. Pub. Health, May, 1931, vol. 21, pp. 529–534.*

This is an address mainly on the present status of the education of industrial hygienists in the United States and Canada.—P. D.

THE HEALTH OF WORKERS. *Foreign Letter (Turkey), Jour. Am. Med. Assn., July 11, 1931, vol. 97, p. 118.*

The eight-hour working day has long been accepted in government and private establishments. As there is no sickness insurance system and as there are few physicians in industry, the general public health law has made provision in regard to the health of workers, in addition to which a comprehensive labor law is now in preparation.

According to the provisions made in the public health law, no child below the age of 12 may be employed as either workman or apprentice in an industrial establishment. It is not permitted that children, either girls or boys, between the ages of 12 and 16 work more than eight hours a day or that they work after 8 P.M. Night work and work carried out below ground may not last more than eight hours out of twenty-four for any workman. Municipalities are to prohibit the work of persons below the age of 18 in restaurants, bars, cabarets, dance halls, cafés, casinos, and bathhouses. Pregnant women may not be employed in any work which may possibly be injurious to their health or that of the child. This ruling is effective for a period of three months preceding and three months following the confinement. Two intervals of one-half hour each should be accorded for six months to all nursing mothers who have resumed their work at the termination of the rest period prescribed by law. It is prohibited that alcoholic drinks be sold in industrial establishments of any kind, in mines, on building sites or in their environment. In order to safeguard the health of workmen the ministry of health and social assistance in collaboration with the ministry of national economy is to prepare regulations which are to determine the character and the hygienic conditions of workrooms, lodging houses, and annexes. All employers permanently having in their employ up to fifty workmen are under obligation to procure the service of one or more physicians in order to supervise the health of the workers and attend them in case of illness. In large establishments and in those where there is a probability of accidents the physician should live on the grounds of the establishment or in its immediate neighborhood. Establishments in localities where there are no hospitals are to have a sickroom and all necessary equipment for rendering first aid. Establishments permanently employing from 100 to 500 workmen are to have an infirmary, and those employing more than 500 workmen a hospital at the rate of one bed to every 100 persons.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

OCCUPATIONAL NEOPLASTIC DISEASE. *C. D. Haagensen. Abstr. as follows from Am. Jour. Cancer, April, 1931, vol. 15, pp. 641–703, in Jour. Am. Med. Assn., June 13, 1931, vol. 96, p. 2065.*

Haagensen has found a high incidence of skin cancer among employees in gas works, probably the result of their exposure to tar, and among petroleum refinery workers as a result of their contact with crude oil and its distillation fractions. His studies of incidence also lead him to conclude that occupational exposure to lubricating oil, as in the case of mechanics and machinists, predisposes to cancer of the penis and scrotum—a predilection as to anatomic site which seems best explained by the uncleanliness of the external genitalia so common in laborers. A significant excess of cutaneous cancer among outdoor workers, affecting particularly the face and lower lip, confirms the importance of sunlight in the etiology of skin cancer. Although he did not find any new types of occupational neoplastic disease, he describes some rare forms, such as lymphatic leukemia caused by radium. The not infrequent changes in the blood picture resulting from exposure to roentgen rays and radioactive substances warrant monthly blood counts in all such workers. The fact that metastases occurred in 63 per cent. of his cases of occupational roentgen cancer suggests that this type of carcinoma is more malignant than some authors have reported it to be. This observation may indicate that its treatment should be more radical. A study of the cases of cancer of the lung and bladder showed no apparent association with occupation. In the data examined the author found a high incidence of skin cancer in some groups—such as clergymen—in which an occupational risk was not apparent. This suggests that occupational exposure is only one of the probably multiple etiologic factors of cancer.—C. K. D.

THE INCIDENCE AND CAUSE OF INDUSTRIAL CANCER. *L. D. Bristol. Med. Jour. and Rec., March 4, 1931, vol. 133, pp. 236–238.*

1. In an industrial group whose employees are occupied in average industrial pursuits, not associated with any special health hazard, the cancer incidence is not materially different from that of the population in general, when all contributory factors such as age and sex are taken into account.

2. The occupations of sailors, seamen, and fishermen should be added to the list of those particularly exposed to the harmful influence of tar and pitch.

3. So-called occupational cancer seems to be largely dependent upon the deleterious physical and chemical influences of carbon, hydrocarbons, and their derivatives, on the growth promoting (especially oxidase and peroxidase) and growth restricting (particularly catalase) enzymes of local cells and tissues.

4. Evidence points to the fact that the very high incidence of skin cancer among chimney sweepers (scrotum) and among the wearers of the warm kangri basket and kairo box (abdominal) may be due to the adsorption and concentration of, and accelerated or

paralyzing action on the growth promoting and growth restricting cell enzymes by the approximately pure carbon in the form of soot or charcoal embedded in and acting catalytically on local skin tissues; plus the increased local temperature and hydrogen ion content of the latter.

5. According to the writer's enzyme or catalyst theory, cancer is the result of a combination of:

I. A local "formative stimulus" due to the catalytic action of local, concentrated oxidizing enzymes (particularly peroxidase), or an increase in their coenzymes (accelerators), in one or more previously normal cells; these cells, unless their growth enzyme activities are properly checked, take on a new, independent energy production and growth rate as a result. The transmission of this newly acquired concentration, or accelerated action, of endoenzymes from parent cell to daughter cells assures the progeny a permanent and independent increase in energy production, growth rate, and division rate. This concentration may be brought about by numberless agents through the process of injury and inflammation (usually chronic) in which the lymphocytes and other white cells are attracted to an area where their enzymes are liberated as a rule over a long period of time, in an abnormal amount.

II. A general or local decrease, inhibition or "paralysis" of the enzymes (particularly catalase) and antienzymes which control cell oxidation, energy, and proliferation, through various acquired or hereditary influences.

6. The influence of carbon, hydrocarbons, and their derivatives, associated with various occupations, is only one of a number of unfavorable influences which may be brought to bear on the growth promoting and growth inhibiting cell enzymes of local tissues to cause malignant growth.—*Author's Summary and Conclusion.*

LUNG CANCER OF INDUSTRIAL ORIGIN. *S. Doubrow. Abstr. as follows from Paris méd., March 21, 1931, vol. 1, p. 287, in Jour. Am. Med. Assn., July 4, 1931, vol. 97, p. 66.*

Doubrow briefly reports observations made in Germany and Czechoslovakia on lung cancers of industrial origin. In Germany as well as in Czechoslovakia they are limited mostly to a few definite mining regions, in the former to the mines of Schneeberg (whence comes its synonym, "Schneeberg disease"). A similar survey in France does not reveal that the miners are affected by this disease. The average age of persons affected by such lung cancers is 55 years (37 and 69 years are the age limits). Clinically, cancer of Schneeberg does not differ much from other lung cancers. In 154 laborers examined at Schneeberg in the last three and one-half years there occurred twenty-one deaths from this type of cancer. In thirteen cases the clinical diagnosis was proved at necropsy. In the remaining eight cases, necropsy was not performed. In Czechoslovakia in the last two years necropsy was performed on eight of fifteen deceased miners of Joachimsthal. In all except two with tuberculous lesions it was shown that the cause of death was cancer of the lung of industrial origin. It is interesting to note that cancer (except lung cancer) was observed in 8.3 per cent. of the mining region population and in 14 per

cent. of the miners. The etiology of this rare disease is still obscure, even though one takes into consideration the geographic as well as the geologic causes and more particularly the chemical composition of the minerals mined. The author quotes the German investigators as follows: If one attributes dust inhalation as the etiologic factor in the production of cancer of Schneeberg, one naturally has to explain why other categories of workers exposed to pneumonokoniosis do not present lung cancers with the same frequency but, on the contrary, succumb more often to tuberculosis.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

ANALYSES OF SMOKE GASES. *K. Wollin. Abstr. as follows from Die Gasmaske, Feb., 1931, vol. 3, pp. 1–5, in Chem. Abstr., June 10, 1931, vol. 25, p. 2783.*

In connection with the development of gas masks suitable for firemen, a large number of smokes likely to be met in fighting fires were analyzed for their gas contents. Some smoke samples were prepared under laboratory conditions and others were taken from industrial plants and actual fires. Air mixed with blast furnace gas varied in carbon monoxide content from about 1 per cent. to about 33 per cent., the latter being practically pure blast furnace gas. Smokes from cellar fires varied in carbon monoxide content from 0.04 to 0.4 per cent., in carbon dioxide content from 0.05 to 3.4 per cent., and in oxygen content from 17 to 21 per cent. Smokes from roof fires varied in carbon monoxide content from a trace to 0.2 per cent., in carbon dioxide content from 0.1 to 2.7 per cent., and in oxygen content from 17.7 to 20.7 per cent. Smokes from miscellaneous fires varied in carbon monoxide content from 0.01 to 1.4 per cent., in carbon dioxide from 0 to 10.1 per cent., and in oxygen from 9.9 to 20.8 per cent. There was, of course, a wide variation in the composition of smokes produced under experimental conditions.—P. D.

SMOKES AND SMOKE GASES. *E. Smolczyk. Abstr. as follows from Ztschr. f. d. ges. Schiess- u. Sprengstoffw., 1931, vol. 26, pp. 132–135, in Chem. Abstr., June 20, 1931, vol. 25, p. 3098.*

This is a discussion of the products of a fire from the standpoint of danger to exposed personnel, particularly firemen. The greatest danger comes from the smoke, composed of both solid and liquid particles. These are present in the largest quantity early in the fire before the temperature is sufficiently high to prevent the approach of firemen. They frequently contain substances which deaden the nerves in the mucous membrane and act as narcotics, causing sudden collapse. The mechanism of this action is described. Less dangerous are irritant gases and carbon monoxide. Suitable gas masks containing smoke filters are described. —P. D.

POISON GASES IN INDUSTRY AND IN FIRES. *E. Smolczyk. Abstr. as follows from Die Gasmaske, Feb., 1931, vol. 3, pp. 9–12, in Chem. Abstr., June 10, 1931, vol. 25, p. 2783.*

This is a discussion from the stand-

point of the protection of firemen.—P. D.

MODERN METHODS OF BREATH PROTECTION. *F. Klein. Abstr. as follows from Metallbörse, 1931, vol. 21, pp. 219–220, 268–269, 316–317, 364–365, 412–413, 460–461, in Chem. Abstr., July 10, 1931, vol. 25, pp. 3413–3414.*

The history of the protection of human beings from the injurious effects of gases and vapors is outlined. Every poisonous substance which can cause injury to the pulmonary tract must exist as a gas, a vapor, a cloud or a smoke, and must consequently obey more or less the gas laws. A long discussion is presented on particle size, movement of particles, size of pores in different filter materials, movement of particles when passing through these, calculation of "resistance time," the "dead layer," particle size and selection of filter material, intermittent passage of gas, vapor, etc. Coarse dispersoids, *e.g.*, dust, soot, etc., are mechanically removed by the filter materials, acting like sieves. Filters for such substances are quite unsuitable for finer particles. For these, only filters that have an adsorptive action are effective. Clouds consist of droplets which wet the surface of the pore walls, and hence can be redissolved subsequently by gases passing later. For clouds, materials made from cellulose are very effective because they combine an affinity for water with great capillary action. For the filtration of smokes, which for the most part consist of solid particles, fibers with rough surfaces, *e.g.*, wool or felt, are much more effective than smooth-surfaced fibers. For substances in the state of gas or vapor it is most important to catch the particles by capillary condensation. If the gas or vapor is chemically active, chemical reactions, often catalytic, must be considered. In testing the active material for its capacity to absorb the poison gas concerned, the static as well as the dynamic method is used. The first gives the capacity at equilibrium; the latter, by far the more important, gives a picture of the behavior of the material in use. Various tests are described. The physiologic bases of breath protection are discussed. Poisonous substances in the air are classified thus:

1. *Industrial poisonous gases:* (*a*) gases such as carbon dioxide, carbon monoxide, methane, acetylene, a large number of easily volatilized organic compounds, the halogens and many of their compounds, sulphur dioxide, hydrogen sulphide, nitric oxide, arsine, hydrocyanic acid, and ammonia; (*b*) smokes such as ordinary smoke, lead and zinc fumes from smelters, foundries, soldering, autogenous welding, and various metal spraying processes (Schoop, etc.); (*c*) dusts, such as charcoal dust, street dust, arsenic compounds, etc.; and (*d*) mists in the chemical industry, varnish manufacture (sulphur trioxide, organic solvents, nitrobenzene, chlorinated hydrocarbons, amyl acetate, turpentine, etc.).

2. *War gases:* (*a*) "green cross" war gases (halogens and their compounds, easily volatilized and easily decomposed organic compounds, *e.g.*, phosgene, esters of chlorocarbonic and perchloroformic acids, halogen cyanides, bromoacetone, bromobenzyl cyanide, chloroacetophenone); (*b*) "blue cross" war gases which are temporary in their

effect and which for the most part pass through the usual gas mask absorbent, such as arsine, diphenylarsine chloride, diphenylaminearsine dichloride, diphenylarsine cyanide; (*c*) slowly acting, difficultly volatile "yellow cross" war gases such as mustard gas and lewisite.

Numerous filling materials for gas masks are discussed, with references to the journal literature and to the patent literature. Gas mask construction also is considered.—P. D.

THE RISK OF EXPLOSION OF MIXTURES OF AMMONIA AND AIR ACCORDING TO OLD AND NEW INVESTIGATIONS. *E. Banik. Abstr. as follows from Zentralbl. f. Gewerbehyg., Dec., 1930, N. S. vol. 7, pp. 337–340, in Bull. Hyg., June, 1931, vol. 6, p. 469.*

As a result especially of investigations by Schliephake, von Nagel, and Schemel, as to (1) the limits of explosion of various gases and air mixtures, (2) the velocity of the explosion, and (3) the pressure exerted in the explosion, it has been clearly shown that mixtures of ammonia and air can only be made to explode with much greater difficulty than can mixtures of gas (H_2) and air. The limits of explosibility are relatively narrow—with a lower limit of 16 and an upper limit of 27 per cent., as compared with 9.2 and 66.3 per cent. for hydrogen, 8 and 19.2 per cent. for illuminating gas, 3.3 and 14.5 per cent. for ethylene, 1.4 and 6.3 per cent. for benzol vapor, and 1.6 and 7.5 per cent. for ether.

Similarly the velocity of explosion and consequently the shattering power are very much less. It is because of the relatively narrow limits of explosibility of air that explosions are so seldom reported.

The view previously held was that the few explosions that had taken place were due to the increase of temperature caused by the pressure to which the ammonia was subjected in the compressors of refrigerating machines, which resulted in hydrogen being split off from the ammonia and the formation of detonating gas, a mixture of hydrogen and oxygen.—T. M. L.

POISONING IN A FLY PAPER FACTORY BY AN ANILINE HOMOLOGUE. *E. Rosenthal-Deussen. Abstr. as follows from Arch. f. Gewerbepath. u. Gewerbehyg., 1930, vol. 1, pp. 380–396, in Bull. Hyg., May, 1931, vol. 6, pp. 406–407.*

This is an interesting paper showing the effect on ninety-six women workers employed in a badly ventilated room, kept at a high temperature, where fly paper was made by a process in which paper was smeared with a composition of resins and oils to which a small quantity (1 to $1\frac{1}{2}$ per cent.) of an amido compound of the aromatic series had been added to help keep it moist. Full details of all the symptoms and blood examinations are given: cyanosis, diminution in the red and white blood cells, painful micturition, and, in not a few cases, reddish coloration of the urine with the presence of red blood corpuscles, were found. Slight jaundice occasionally was present with the cyanosis.

Diminution in the percentage of the amino compound to $\frac{1}{3}$ per cent., improvement in ventilation up to twenty-two changes of the air of the room per hour, and reduction in temperature lessened the symptoms considerably.—T. M. L.

RESEARCHES INTO INDUSTRIAL ILLNESSES PRODUCED BY THE AROMATIC

AMINO COMPOUNDS. *R. L. Mayer. Abstr. as follows from Arch. f. Gewerbepath. u. Gewerbehyg., 1930, vol. 1, pp. 436–495, in Bull. Hyg., June, 1931, vol. 6, p. 470.*

The view the author takes is that all *poisonings* (in contradistinction to dermatitis) produced by the aromatic amino compounds arise from the direct reaction between the more highly oxidized intermediate products and certain constituents of the organism, *e.g.*, hemoglobin. Quinone and hydroxylamine are examples of such intermediates.

Dermatitis and eczema, on the contrary, are allergic manifestations of idiosyncrasy, but they also do not develop except as a result of the action of intermediate bodies, and it is the quinone oxidation products which alone cause the condition. Derivatives of hydroxylamine oxidation products are harmless.

Similarly, *asthma* is an allergic manifestation produced by aromatic amine bodies and so far has only been seen to arise with certainty from para-phenylenediamine. The author thinks that the quinone intermediate products are again the cause.

In the production of cancer of the bladder it is difficult to say whether this is due to direct reaction or to indirect reaction through the intermediates. The author has only been able experimentally to produce atypical epithelium growth through the administration of aromatic amines. The author suspects that quinone bodies play a part.—T. M. L.

CLINICAL AND ROENTGENOLOGIC INVESTIGATIONS INTO THE HEALTH OF THE WORKERS AT THE ARSENIC REDUCING WORKS AND STATE MINES OF FREIBERG, SAXONY. *E. Saupe. Abstr. as follows from Arch. f. Gewerbepath. u. Gewerbehyg., 1930, vol. 1, pp. 582–593, in Bull. Hyg., June, 1931, vol. 6, p. 470.*

Following on two fatalities from lung carcinoma in workers employed in the state arsenic reduction works of Saxony, the author made a complete examination of the forty persons coming into contact with arsenic. The arsenic is volatilized at a temperature of 220°C. into arsenic trioxide and collected in condensing chambers. The processes of its removal by hand are described and the purposes which the arsenic serves. The total number employed in this department was forty and the duration of employment considerable. In seven cases it was from six to ten years, in six from eleven to fifteen, in eight from twenty-six to thirty, in four it was between thirty and forty, and four between forty and fifty. Only ten had been there under five years. The furnace workers are those most exposed to risk, and twenty-eight of these were examined. The majority were well nourished; skin eruptions were common, fourteen having papular, pustular, and eczematous conditions existing over extensive areas of the chest and back, neck, and round the mouth and nose, the elbows, extensor and flexor surfaces of the forearm, the lower part of the abdomen, the groin and genital organs, and the front of the thigh. Two showed pronounced melanosis; 80 per cent. showed ulceration and perforation of the septum of the nose. Apparently these lesions had all occurred despite careful observation of the requirement to wear sponge respirators and protective clothing.

Arsenic was present in the eight cases of hair and the seven cases of nails examined. Physical examination of the internal organs did not reveal much beyond the fact that rather more than one-quarter of those examined showed slight changes suggestive of pneumonokoniosis on X-ray examination. A detailed report is given of the autopsy on the two cases of carcinoma of the lungs.—T. M. L.

Skin Cancer Produced in Mice by Carbon Dioxide Snow. *B. J. Mansens. Nederl. Tijdschr. v. Geneesk., March 21, 1931, vol. 75, p. 1444.*

Parkinsonism Due to Poisoning by Carbon Disulphide. *F. Negro. Abstr. as follows from Rev. neurol., Nov., 1930, vol. 2, p. 518, in Arch. Neurol. and Psychiat., July, 1931, vol. 26, pp. 205–206.*

Parkinsonism is not a disease but a syndrome that may be produced by a variety of causes. The substantia nigra and the globus pallidus are involved to different degrees in different cases. Recently, a number of instances of parkinsonism following intoxication with carbon disulphide have been recognized. The patient whose case is reported was a worker in artificial silk who presented no indication of encephalitis or venereal disease. Two years after beginning work, general malaise, weakness—especially in the lower limbs—and impotence developed insidiously. Some months later, tremors began in the upper limbs, with psychic disturbances characterized by depression and irritability. At the time of examination, a clinical picture of parkinsonism was evident. The tremor was constant during rest, was interrupted by voluntary movement, and could be controlled momentarily by the patient. In walking, the patient held the arm flexed and close to the abdomen, with fingers enclosing the thumb. Speech was slow and monotonous, and writing was typical of parkinsonism. There was a definite cogwheel phenomenon, with an increase in reflexes, but no Babinski sign. The pupils reacted normally; there was diminution of convergence, but no nystagmus. No sensory disturbances were elicited, and the electrical reactions were normal. The serology was normal.

Aside from the interest in the etiology in this case of parkinsonism, the author emphasizes the importance of the cogwheel phenomenon as indicating hypertonicity of the sarcoplasm, thereby differentiating an extrapyramidal disease from simple intoxication due to alcohol, mercury, tobacco, etc. The clinical symptoms of poisoning due to carbon disulphide are similar to those of poisoning due to carbon monoxide and manganese. Moreover, cyanides have occasionally produced similar symptoms. The occupational hazard is noted.

Carbon Monoxide Poisoning. *Abstr. as follows from U. S. Nav. Med. Bull., Jan., 1931, vol. 29, pp. 172–178, in Bull. Hyg., June, 1931, vol. 6, pp. 492–493.*

Details are given of two instances, involving twelve men, of accidental poisoning by carbon monoxide which occurred in compartments of battleship "blisters." Blisters are false hulls fitted over the original hulls of old battleships in modernizing them. In one case poisoning was due to the use

of an oxygen-acetylene torch in a space so small and ill ventilated that sufficient oxygen was not available to oxidize all the carbon monoxide and hydrogen, which are the products of the combustion of the torch and which, under normal conditions, are rapidly converted into carbon dioxide and water. In the second case the source of the carbon monoxide was not ascertained but the compartment had not been opened for six months. Four parts of carbon monoxide per 10,000 of air is the usually accepted maximum permissible concentration, but length of exposure, humidity, temperature, exertion, and susceptibility are important factors, and symptoms have occurred with as little as two parts of carbon monoxide per 10,000. When human hemoglobin comes in contact with a mixture of carbon monoxide and oxygen, the proportions of carboxyhemoglobin and oxyhemoglobin are according to the relative tensions of the two gases respectively in the mixture, and with changes in the respective tensions, oxygen will replace carbon monoxide or vice versa. Therefore, provided that there are any signs of life at all, there is always a possibility of reviving the patient though, if important tissues have been permanently damaged, he will not ultimately survive. The administration of pure oxygen with the application of artificial respiration is the treatment to be adopted and respiration may be stimulated centrally by the use of a 5 per cent. mixture of carbon dioxide in oxygen.

To prevent accidents, closed compartments should be forcibly ventilated before being entered, and if this cannot be done gas masks and life lines should be worn and oxygen should be available. No welding should be done in double bottoms or similar compartments unless an efficient means of forced ventilation has been arranged.—C. F. W.

BEHAVIOR OF THE CATALYST IN THE CANISTER OF THE CARBON MONOXIDE GAS MASK. *G. Stampe and F. Bangert. Abstr. as follows from Ztschr. f. d. ges. Schiess- u. Sprengstoffw., 1931, vol. 26, pp. 24–26, in Chem. Abstr., June 10, 1931, vol. 25, p. 2784.*

Gas mask canisters for all gases except carbon monoxide depend upon the principle of physical or chemical sorption, and their useful life is determined by the amount of gas absorbed. In the carbon monoxide mask, however, the amount of carbon monoxide absorbed plays an insignificant part in its useful life, which depends in large measure upon the other foreign gases in the atmosphere. It is especially sensitive to moisture and for this reason must contain a very efficient drying agent. Stampe and Bangert describe the behavior of the carbon monoxide canister when other poison gases, both alone and in addition to carbon monoxide, are present in the air. With an air flow of 30 liters per minute and a toxic concentration of 1 volume per cent., the amounts of toxic gases in grams taken up by the Dräger carbon monoxide canister and the breakpoints in minutes are as follows: phosgene, 3.4 gm., 27 minutes; chlorine, 7.2 gm., 81 minutes; hydrogen cyanide, 3.3 gm., 98 minutes; sulphur dioxide, 18.5 gm., 232 minutes; hydrogen sulphide, 19.9 gm., 467 minutes; ammonia, 2.3 gm., 108 minutes; carbon tetrachloride, 8 gm., 41 minutes; ben-

zene, 10 gm., 103 minutes. The effect of other gases in addition to carbon monoxide was determined by passing a continuous air flow of 30 liters per minute through the canister. During the first hour of the tests carbon monoxide and other toxic gas were added to the air stream. These were then omitted for one-half hour and added again for another hour, etc. The concentration of carbon monoxide was 0.5 volume per cent. while the concentration of the other gas used varied. The relative humidity was 30 per cent. in all cases but one, when 90 per cent. was used. The breakpoints for the second toxic gas were determined and the points of maximum allowable concentration in the exit gas for carbon monoxide. The results are shown by curves from which the following points are taken:

Second Gas Added	*Breakpoint for Second Gas* total hrs.	*Maximum Allowable Concentration CO* total hrs.
None.....	.....	69.0
0.05 vol. % H_2S....	15.50	24.0
0.026 vol. % HCN.	10.75	19.0
0.031 vol. % SO_2...	21.00	15.5
0.015 vol. % Cl_2...	13.50	14.0
None, but with 90% relative humidity	.....	11.0

The catalyst (hopcalite) is pointed to an equal extent by the following parts of the gases named: chlorine 10, sulphur dioxide 23, hydrogen cyanide 25, hydrogen sulphide 58, water vapor 150 (drying agent present). Concentrations shown on curves are ten times those shown in the text and are probably in error.—P. D.

CARBON TETRACHLORIDE POISONING WITH MACROSCOPIC FAT IN THE PULMONARY ARTERY. *H. E. MacMahon and S. Weiss. Am. Jour. Path., Nov., 1929, vol. 5, pp. 623–630.*

1. The gross and microscopic findings are described in an unusual case of carbon tetrachloride poisoning in which the blood in the right side of the heart and larger pulmonary arteries contained an extremely high percentage of fat (60 per cent.).

2. The severe damage to the liver, which was already large and filled with fat, was the probable source of the fat in the vascular system.

3. Fat droplets that were small enough to pass through the capillaries of the lung and to gain entrance into the capillaries of other organs produced no microscopic lesions in either the heart, brain, or kidney.

4. It appears from these observations that the sensitiveness of alcoholic patients to carbon tetrachloride is increased not only because of increased absorption of the drug, as well as the synergistic action of alcohol and carbon tetrachloride together in producing liver damage, but also because of the possible presence of preexisting liver damage.—*Authors' Summary.*

ALTERATIONS IN THE NERVOUS SYSTEM IN WORKERS IN QUICKSILVER MINES. *A. M. Weger. Abstr. as follows from Arch. f. Gewerbepath. u. Gewerbehyg., 1930, vol. 1, pp. 522–538, in Bull. Hyg., June, 1931, vol. 6, pp. 470–471.*

A brief account only is needed of this paper, seeing that it is recognized how few engaged in the recovery of mercury escape the effects from the vapor.

The author examined 138 workmen engaged in recovering mercury in the mines of Nikitowka (in the Don val-

ley); of these, only twenty-nine were free from obvious changes in the nervous system, while 109 (79 per cent.) were obviously affected. These changes take the form of tremor, hypochondriacal fears and neurasthenia, psychical depression (mercurial erythism). Lesions of the nervous system from mercurial intoxication showed themselves on the average after three months' employment.

Improvement in health, in the author's opinion, can be found only by (*a*) mechanization of all the industrial processes, (*b*) prohibition of the employment of women and young persons, and (*c*) regular periodic medical examination of the workmen. A detailed protocol is given of the symptoms in five cases.—T. M. L.

ANTIFREEZE METHANOL HAZARD. *M. Trumper. Abstr. as follows from Internat. Clin., 1931, vol. 1, pp. 85–89, in Chem. Abstr., June 10, 1931, vol. 25, p. 2783.*

From a critical study of the literature, the conclusion is drawn that "a maximum permissible concentration of methanol for this new use in the radiators of automobiles should be established, such concentration being determined by thorough studies made with reference to all types of persons likely to be exposed to its vapors. The general public should not constitute an experimental laboratory for the testing out of a hazard new for the sake of a new industry." A bibliography is appended.—P. D.

METHANOL ANTIFREEZE AND METHANOL POISONING. *W. P. Yant, H. H. Schrenk, and R. R. Sayers. Indust. and Engin. Chem., May, 1931, vol. 23, pp. 551–555.*

The material in this report has already been covered. (See THIS JOUR., 1931, vol. 13, Abstr. Section, p. 134.)

CAUSE OF TOXICITY OF METHYL ALCOHOL. *E. Keeser. Deutsch. med. Wchnschr., March 6, 1931, vol. 57, p. 398.*

CANCER AMONG WORKERS IN CORK BRICKS. *O. Schürch. Abstr. as follows from Deutsch. med. Wchnschr., 1931, vol. 57, pp. 139–141, in Bull. Hyg., June, 1931, vol. 6, p. 468.*

In the manufacture of cork brick and cork board use is made of pitch as a binding material for the finely ground cork waste. Thus there is really no difference between the causation in such workers of epitheliomatous ulceration from that observed for many years in the patent fuel industry, where the anthracite dust is mixed with 10 per cent. of pitch.

The author, however, relates the first two cases of scrotal cancer which have been reported in this industry, which differ in no respect from those that have been described among patent fuel workers.—T. M. L.

EFFECT OF TAR ON EXPERIMENTAL TERATOIDS IN THE RAT. *F. A. McJunkin. Abstr. as follows from Proc. Soc. Exper. Biol. and Med., 1930, vol. 28, pp. 25–26, in Physiol. Abstr., July, 1931, vol. 16, p. 286.*

Coal tar in various dilutions was combined with embryo pulp to determine its effect on teratoid growth. When a 1 in 500,000 strength of tar was used, all the rats showed distinct teratoid growth. When the embryo pulp was mixed with 1 in 200,000 tar, the teratoid growth took place irregularly

and often failed. With tar concentrations of 1 in 25,000 no proliferation of the embryonic cells was demonstrable. Embryonic rat cells brought into contact with tar show no tendency to undergo malignant transformations. The only influence is an inhibition of teratoid development by the tar in greater concentrations.

ON THE POISONOUS EFFECTS OF "BARNIZ," "TINI," AND "POMADA." *D. L. Barrios and J. S. Devoto. Abstr. as follows from Semana méd., 1931, vol. 38, no. 4, pp. 252–257, in Bull. Hyg., June, 1931, vol. 6, p. 472.*

These substances [which the article does not define] are apparently used in industries connected with varnishing and lacquer work. The symptoms produced, common to all, are headache, lassitude, nausea, sensory disturbances in the limbs, disordered sleep, sometimes albuminuria, and nasal hemorrhages. In a table brief notes are given of thirty patients, ages varying from 17 to 49, who had been engaged in this work for periods ranging between two months and eleven years. The blood changes consisted chiefly in leukopenia, average about 5,000 per cubic millimeter, but in one as low as 3,200, with reduction of polymorphonuclears and increase of monocytes. None proved fatal but abortion occurred in some of the patients. The composition of Pomada is not stated, but as solvents of the other two, benzene, toluene, amyl acetate, and ethyl are used. The symptoms are ascribed to the benzene and toluene.—H. H. S.

FURTHER COMMUNICATION ON POISONING FROM VOLATILE POISONS AND THEIR RELATION TO INDUSTRIAL POISONING. *H. Zangger. Abstr. as follows from Schweiz. med. Wchnschr., Dec. 20, 1930, pp. 1193–1201, in Bull. Hyg., April, 1931, vol. 6, pp. 322–323.*

This second paper recapitulates a good deal of what is said in an earlier paper (see THIS JOUR., 1930, vol. 12, Abstr. Section, p. 163), but deals more with specific instances. Throughout both papers the difficulties in the way of producing proof, owing to the slow action of a great many of these organic solvents, are stressed, and, further, the ignorance of medical men as to the nature of the effects produced and of the substances producing them. In recent years the author states that he has been called on nearly nine hundred times to give advice either in specific cases of poisoning or on questions of treatment in regard to solvents.

When actual poisoning is referred to, he confines his remarks largely to effects from tetrachlorethane, trichlorethylene, carbon bisulphide, benzene and its homologues, and potassium cyanide. He believes, however, that inhalation of the various excipients used, for example, in cellulose spraying, must ultimately have a permanent effect on the organs and tissues.

Typical forms of injury are: (*a*) damage to the superficial tissues—the skin and mucous membranes—through fat solvent action; (*b*) injury to the nervous system, again through fat and lipoid solvent action, of which carbon bisulphide is the best-known example; (*c*) remote action on the organs: for example, methyl alcohol as a nerve poison (eye changes and change in unstriped muscle fibers), kidney changes (as from methyl chloride, methyl bromide).

The author gives a brief account of the following industries, in which organic solvents are now largely employed: boot and shoe, leather, laundry and dry cleaning, glass polishing, lithographic and other forms of printing, artificial leather, artificial silk, rubber industry, metal industries, paper industries, extraction of bones, etc., tanning, fat and oil industries, painting, lacquering and protection against rust, building construction, insect and parasitic pests destruction. The author regards as iniquitous the fancy names under which these poisonous solvents come upon the market; *e.g.*, tetralin (tetrahydronaphthalene), decalin (decahydronaphthalene), westropol (trichlorethylene). Many of these names vary according to the country in which they are used. Lack of knowledge of these substances, he believes, has led to wrong diagnosis in cases of poisoning from them, so that not only is treatment incorrect, but the sufferer fails to obtain compensation.

In the section on preventive measures in manufacture, he recommends those where closed apparatus is used and transport from one place to another made by compressed air coupled with means for recovery of vapor escaping. He deals with canister respirators for neutralizing the absorbed gases, refers to the prevention of explosions and insists that, as most of these vapors are heavier than air, they should generally be carried away by downward exhaust ventilation, rather than upward.—T. M. L.

DUST HAZARDS AND THEIR EFFECTS

Accurate Air Separator for Fine Powders. *P. S. Roller. Indust. and Engin. Chem., Analyt. Ed., April 15, 1931, vol. 3, pp. 212–216.*

An apparatus is described for separating quantitatively a 1-kg. charge of fine powder into a series of fractions beginning 0 to 2.5 microns in size. Except for the finest fractions, at or below 5 microns, where attrition by the air current takes place in the case of soft powders, the particle sizes separated are very homogeneous within the limits given by Stokes' law.

Several causes affect the rate of separation, but the most important is that of the rate of air flow. Under similar conditions the rate of separation is proportional to the air flow. Depending on the latter, initial rates of separation of the particle size fractions have been made up to 135 gm. per hour at a flow of 140 liters per minute.

Continuous separation can be effected by the use of an offset separator tube with separate collection of the oversize. At a 30-micron particle size cut of a Portland cement powder, with an air flow of 500 liters per minute, the equivalent rate of feed was 5.4 kg. per hour, while the rate of recovery was 0.92 kg. per hour. The efficiency of recovery, based on the maximum possible recovery in a run, was not in excess of 28 per cent.—*Editor's Summary.*

Separation and Size Distribution of Microscopic Particles. An Air Analysis for Fine Powders. *P. S. Roller. U. S. Bur. Mines, Tech. Paper 490, 1931, pp. 46. Abstr. as follows in*

Chem. Abstr., May 20, 1931, vol. 25, p. 2345.

The various methods for the particle size analysis of a microscopic powder are described. The principle, construction, and operation of an improved air separator are described. Results for the separation of Portland cement and chrome-yellow pigment in steps of 0 to 5, 5 to 10, 10 to 20, 20 to 40, 40 to 60, and 60 to 100 microns are given in detail. A closer separation beginning with 0 to 3 microns was made for gypsum and anhydrite. For soft powders only, in 0 to 5 micron range, there is an attrition of the grains. Quantitative methods for correction are described. A size distribution analysis of the particles of each of the fractions made under the microscope showed that Stokes' law is closely obeyed. In each fraction there is a small overlap of a few microns due to irregularities in the shape and surface of the grains, inhomogeneity of the density of the grains, and incompleteness of fractionation. The most important particle size properties of a powder are those that relate to the surface per unit weight. The mean diameter is defined therefore in relation to the specific surface. The surface mean diameters for the cement powder and chrome-yellow pigment are 9.6 and 6.1 microns, respectively. The dispersion is a measure of the extent of the distribution of the particle diameters about the mean diameter of the microscopic powder. The surface dispersion, related to the surface diameter, is calculated as 13.3 and 6.1 for the cement and pigment, respectively. The latter is therefore twice as homogeneous as the cement. General graphic methods are described with reference to a frequency distribution of the particle diameters. The method in which the area under the curve between 2 diameters gives the surface area of the particles per gram of powder between these diameters is described in detail.—P. D.

Microscopic Determination of Dust in Rooms. *K. L. Pesch. Arch. f. Hyg., Nov., 1930, vol. 105, pp. 61–70.*

The dust concentration in a room is influenced by the extent to which the room is used; it is directly related to the dust concentration in the street air and is influenced by climatic conditions. The author points out that many factors that strongly affect dust in rooms, such as house cleanliness and methods of house cleaning, are too difficult to measure quantitatively. The need for a standard method of dust determination for the study of room dusts is emphasized.—T. H.

Histophysiologic Introduction to the Study of the Pneumonokonioses. *A. Policard. Abstr. as follows from Arch. med.-chir. Appar. respirat., 1930, vol. 5, pp. 1–31, in Ber. ü. d. ges. Physiol. u. exper. Pharmakol., Feb. 25, 1931, vol. 58, p. 314.*

For the purpose of enlarging the incomplete histologic knowledge of the pneumonokonioses, a study was made of the physical conditions of the dust in the inhaled air, its fate in the upper air passages, the bronchi, and the alveoli, and the corresponding histophysiologic reactions. Two kinds of dust may be distinguished: those with an average diameter of 1/100 mm., and those with an average diameter of 1/1000 mm. or less. The distribution of the dust depends on the weight and the shape

of the dust particles and on the air current; in fine dust the brownian movement plays a part. Calcium, silica dust, and coal dust are considered especially. While the histologic reaction in the air passages consists principally in hyperemia and round cell infiltration, in the alveoli phagocytosis prevails. The coal particles are taken up without cytoplasmic change, while quartz slowly exerts a toxic effect on the phagocytosing cell. The article contains numerous details which it is impossible to cover in an abstract.

PNEUMONOKONIOSIS AND TUBERCULOSIS. *H. S. Willis. Abstr. as follows from Medicine, Dec., 1930, vol. 9, pp. 413–506, in Am. Jour. Pub. Health, May, 1931, vol. 21, p. 565.*

This is a review of the whole subject of pneumonokoniosis and tuberculosis in approximately ninety pages divided into seven portions as follows: (1) historical résumé of pneumonokoniosis; (2) types of dust; (3) pathology; (4) diagnosis; (5) prognosis; (6) relationship between tuberculosis and pneumonokoniosis; and (7) prophylaxis and treatment.

It is quite impossible in a brief abstract to do justice to the paper, since in itself it is an interpretation and very complete summary of all the important contributions in this field.

Anyone who is interested in the problem of dust and its effects will find this an invaluable reference work. The paper concludes with a bibliography of 238 references.

PNEUMONOKONIOSIS IN BOLIVIAN MINERS. *G. Orosco et al. Abstr. as follows from Semana méd., 1931, vol. 38, no. 10, pp. 601–634, in Bull. Hyg., June, 1931, vol. 6, pp. 467–468.*

This is a long article containing many points of importance and is worthy of study in the original by those interested in the subject. The chief features only can be referred to here. The whole, like Caesar's description of Gaul, is divided into three parts. The first presents in considerable detail the conditions under which the industry is carried on. The workers use pneumatic drills but, except those engaged in the grinding process later, do not use any protecting masks. Illustrations of the district, the mines, and the different processes and machinery are well reproduced, showing the actual working conditions of the employees. The second part gives clinical histories of typical cases and an account of the pathologic state of the lungs with microphotographs of the lesions produced. The third part details the chemical investigations of the pulmonary tissue, and shows the presence of silica, iron, aluminium, and tin (no lead). Quantitative estimation gave 10.9 gm. of tin per kilogram of the dried tissue and 2.7 per kilogram of the moist. Of iron there were 3.3 parts per thousand of dried substance estimated as ferric oxide, or 2.5 gm. per kilogram expressed as iron; in the undried tissue there was 0.45 gm. per kilogram as ferric oxide, or 0.34 as iron.

The symptoms produced and the resulting disablement from fibrosis of the lungs and the consequent cardiac mischief need not be detailed, but the author rightly demands that prophylactic measures should be put in force to reduce the sickness in an industry which employs a large proportion of

the workingmen of the country.—H. H. S.

PULMONARY ASBESTOSIS II. INCLUDING THE REPORT OF A PURE CASE. *K. M. Lynch and W. A. Smith. Am. Rev. Tuberc., June, 1931, vol. 23, pp. 643–660.*

In a survey of all available literature on the subject up to the present time we have collected 172 cases of pulmonary asbestosis. There are references to this subject in one or two abstracts, notably those of Bridge and of Sir Thomas Oliver, but specific cases are not enumerated. In four cases belonging to Wood's series the diagnosis was doubtful, and in the majority of others the diagnosis was based entirely on clinical and roentgen findings. There were twenty-seven in which the diagnosis was confirmed by the finding of the asbestosis bodies in the sputum, in the lung juice by puncture, or by necropsy. Necropsy has been made on eighteen cases. In three of these the disease was complicated by pulmonary tuberculosis, three by lobar pneumonia, three by bronchopneumonia, and one was a traumatic death. In four the authors failed to give a complete report, stating only that the necropsy confirmed the diagnosis. Including the very first case recorded, that of Murray in the Charing Cross Gazette of 1900, which apparently received little attention until resurrected by Cooke, there are now four records of necropsy on uncomplicated pulmonary asbestosis. Except those reported by ourselves, and those by Pancoast and Pendergrass, and four others by Simson from South Africa, these cases have all developed in the British Isles.—*Authors' Summary.*

A CASE OF PULMONARY ASBESTOSIS. *H. E. Seiler and M. D. Gilmour. Brit. Med. Jour., June 27, 1931, vol. 1, pp. 1112–1114.*

The pathologic findings are reported of a fatal case of asbestosis uncomplicated by pulmonary tuberculosis. The man died, aged 42, after twenty-three and one-fourth years of occupational exposure to asbestos dust in a textile mill. Death was due to cardiac failure secondary to back pressure from massive generalized fibrosis. Before death, cyanosis was pronounced; and diffuse fine mottling of a silicotic type was detected on X-ray. The macroscopic appearances were typical of dense pulmonary fibrosis, with other organs secondarily affected—dilated heart, nutmeg liver, and indurated spleen and kidneys. The fibrosis was generalized, with no nodules or whorls, as in silicosis; no polymorphonuclear cells were to be seen in the bronchi or elsewhere. Asbestosis bodies were abundantly present, and also a great deal of yellow pigment in the form of granules and globular masses. No tuberculous lesions were found.—E. L. C.

THE FORMATION OF THE ASBESTOSIS BODY IN THE LUNG. *S. R. Gloyne. Tubercle, June, 1931, vol. 12, pp. 399–401.*

Pictorial presentation is given in this short note of the formation of asbestosis bodies. They appear to be formed by the deposition of some organic material around an asbestos fiber; this material then fissures or cracks, giving rise to the appearance of segments; finally, fragmentation from the asbestosis body may separate portions. There is evidence that iron

is a component of the material deposited on the inhaled fiber. During the reaction which takes place, solution of a fraction of asbestos occurs; but evidence is lacking as to how the long asbestos particles, which are far longer than the diameter of a dust cell, are introduced into the pulmonary tissues. —E. L. C.

PNEUMONOCONIOSIS. THE DELAYED DEVELOPMENT OF SYMPTOMS. *J. A. Britton and J. R. Head. Jour. Am. Med. Assn., June 6, 1931, vol. 96, pp. 1938–1939.*

Most clinical and statistical studies of silicosis have been made on groups of men still employed in dusty trades. From such statistics one cannot say what is the late effect of short exposures. In this paper we have reported four cases of silicosis or silicosis and tuberculosis which developed many years after relatively short exposures. These instances suggest the necessity of revising the conception of the length of exposure necessary to produce the disease and make it seem probable that after relatively short exposures sufficient dust must be deposited in the lungs to set up a progressive fibrosis, which only after many years becomes sufficiently extensive to produce symptoms. They tend to indicate that men in the work develop symptoms only after many years of exposure, not because that length of exposure is necessary but because it takes a long time for the disease to develop. —*Authors' Conclusions.*

SILICOSIS. *T. H. Belt. Canadian Med. Assn. Jour., Dec., 1930, vol. 23, pp. 802–804.*

This is a general discussion of silicosis and of the various theories as to the method of action of silica dust in the lungs.—M. C. S.

DIAGNOSIS OF PULMONARY SILICOSIS. *C. Garin. Abstr. as follows from Presse méd., April 18, 1931, vol. 39, p. 568, in Jour. Am. Med. Assn., July 11, 1931, vol. 97, pp. 143–144.*

Garin states that most of the authors cited by him reported cases of silicosis in which tuberculosis was present. None of them attempted to bring out the differences between the two conditions. He stresses mostly the roentgen side of the question. In his roentgen studies he found that about 85 per cent. of the cases are those of a granular silicosis. He believes that the granular aspect of chest roentgenograms is not positively that of pure silicosis and it should not serve as an exclusive base for diagnosis of silicosis. The diagnosis between simple silicosis with a granular picture and pulmonary tuberculosis is, however, easy: the patients with silicosis have no fever and the condition is progressive. On the other hand, diagnosis becomes almost impossible in cases of silicotuberculosis, in which the tubercle bacillus interferes with the development of a pure silicosis. In such cases it is impossible to pronounce the patients sick with silicosis or with pure tuberculosis. One can only make a diagnosis of silicotuberculosis.

OCCUPATIONAL INFECTIOUS DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

CASE OF ANTHRAX IN MAN. *C. Rasch. Abstr. as follows from Ugesk. f. Laeger, March 19, 1931, vol. 93, p. 307, in Jour. Am. Med. Assn., June 13, 1931, vol. 96, p. 2080.*

Rasch reports the case of a man on whose hands two lesions developed after he had handled a cow with anthrax. A scraping made under the crust on the larger plaque, when stained with methylthionine chloride, revealed numerous typical anthrax bacilli. This result is almost always obtainable, he says, if examination of untreated primary anthrax is made during the first three days. Treatment with 0.75 gm. of neoarsphenamine three times daily, at intervals of from three to five days, together with hot local applications, was followed by rapid recovery.—C. K. D.

PNEUMONIA IN BROWN IRON ORE MINERS. *W. Schopper. Abstr. as follows from Arch. f. Hyg., Sept., 1930, vol. 104, pp. 175–183, in Bull. Hyg., April, 1931, vol. 6, p. 322.*

In this paper, Schopper, after referring to the well-recognized peculiar symptoms of chronic manganese poisoning, has followed up the other aspect of its action, namely, the association with pneumonia. He describes the postmortem appearances of two miners who had died of this. In addition to the ordinary signs of pneumonia, he found throughout the lungs extensive deposits of foreign material rich in manganese which had led to fibrosis of the lungs.

He considered that his findings, together with the clinical experience of the medical men in the district of Giessen, where the manganese ores are mined, explained the prevalence of the pneumonic symptoms, but the classical symptoms of chronic manganese poisoning are unknown in the district in question.—T. M. L.

ULTRA-VIOLET RADIATION AND RESISTANCE TO INFECTION: INTRANASAL INFECTION WITH THE PNEUMOCOCCUS AND WITH BACTERIUM LEPISEPTICUM IN THE RABBIT. *M. Hardy and J. Chapman. Am. Jour. Hyg., Jan., 1931, vol. 13, pp. 255–280.*

Exposure of rabbits to direct sun and to artificial radiation from a mercury arc had little or no effect on mortality rate, and on resistance to pneumococcus and *Bacterium lepisepticum* infection, and little effect on blood counts and antibody formation.—C. P. Y.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

DERMATITIS FROM CELLULOSE VARNISHES. *J. Rousset. Méd. du travail, May, 1931, vol. 3, pp. 76–82.*

The occurrence of outbreaks of skin troubles in a furniture factory led to investigation of the composition of the varnishes used. The composition of the fluids used for filling and for cleaning the wood, and for diluting the varnishes is given. These fluids contain a number of volatile grease solvents. Experiments by applying them to the skin failed to reproduce the condition which occurs in the workers; but wood vinegar and benzene, two of the constituents, did cause some ery-

thema. The dermatitis among the workers resembled that often seen in industry affecting the exposed parts of the body, starting with redness and irritation and proceeding to more definite eczema. Each case cleared up fairly rapidly on cessation of work. Some instances were undoubtedly due to using solvents, such as thinners for varnishes, to clean the skin. Indeed, the trouble would seem to be due to removal of the natural grease from the skin, thus leaving it dry and open to microbic attack, rather than to any particularly harmful property in the solvents. The author does not note this point, but remarks that the eruption is not seen on the palms of the hands, which have no sebaceous glands. —E. L. C.

Dermatitis Venenata Due to Contact with Brazilian Walnut Wood. *L. Schwartz. U. S. Pub. Health Rep., Aug. 14, 1931, vol. 46, pp. 1938–1943.*

Eleven cases of dermatitis venenata occurred among 100 workmen in a cabinetmaking plant due to contact with Brazilian walnut (*"embuia,"* species of *Nectandra*), especially in persons exposed to the sawdust. Cases also occurred in nine out of ten other plants using the wood. Tolerance is developed as a rule.

Patch tests with sawdust from this wood on three volunteers showed positive reaction in each case.—*Author's Summary.*

Myopia and Occupation. *L. Telecky and A. Thier. Abstr. as follows from Arch. f. Gewerbepath. u. Gewerbehyg., 1930, vol. 1, pp. 240–270, in Bull. Hyg., May, 1931, vol. 6, p. 403.*

The relation of employment to the development of myopia is a very difficult problem. In the past, certain figures have been collected by various observers, but they seem to have been too much inclined to draw conclusions from the supposed nature of the work as indicated by its name, and to have given insufficient attention to the important details of position, etc., in which the individual workers differ one from another. It is possible, therefore, only in a few instances to find trustworthy evidence. It may be noted, however, that there is good reason for holding that jewelers and others who use monocular vision and a lens suffer less from myopia than those who make use of binocular vision. One of the authors has made a careful study of the employees engaged in the manufacture of cloth, and has investigated their several postures at work. In many cases examined by them, there was a clear history that the myopia had come on years after the beginning of the work. They ask that in future investigation on this important subject, full details be given of the nature of the work, its duration, and the position of the worker; they are inclined to regard as most important the use of binocular vision and the bowing of the head; they think that in trade groups which they personally examined, the development of myopia in the later years of life among those engaged in very close work is proved with certainty.—H. G.

INDUSTRIAL SURGERY

I. Experimental Shock: Probable Cause for Reduction in Blood Pressure Following Mild Trauma to an Extremity. *A. Blalock. Arch. Surg., April, 1931, vol. 22, p. 598.*

II. *Idem:* Importance of Local Loss of Fluid in Production of Low Blood Pressure after Burns. *A. Blalock. Ibid., p. 610.*

III. *Idem:* Composition of Fluid That Escapes from Blood Stream after Mild Trauma to an Extremity, after Trauma to Intestines and after Burns. *J. W. Beard and A. Blalock. Ibid., p. 617.*

IV. *Idem:* Study of Effects of Loss of Whole Blood, of Blood Plasma and of Red Blood Cells. *G. S. Johnson and A. Blalock. Ibid., p. 626.*

V. *Idem:* Observations on Water Content of Tissues of Body after Trauma and after Hemorrhage. *P. N. Harris and A. Blalock. Ibid., p. 638.*

Abstracted as follows in Jour. Am. Med. Assn., June 13, 1931, vol. 96, pp. 2068–2069.

I. In experiments on dogs anesthetized by barbital, Blalock studied the effects of mild trauma to one of the extremities. The time interval that elapsed between the initiation of the trauma and the amputation of the extremities varied from seventeen to seventy hours. In five experiments the average of the mean blood pressures was 108 mm. of mercury at the time of the amputation, and the average difference in weight of the two extremities amounted to 2.41 per cent. of the body weight. In ten experiments the mean blood pressure was less than 70 mm. of mercury at the time of the amputation and the difference in weight of the two extremities was 3.66 per cent. of the body weight. Previous experimental work indicates that the fluid that was lost was mainly the whole plasma of the blood. Reasons are given for the belief that the loss of fluids into the traumatized region was the chief if not the sole cause for the reduction in the blood pressure.

II. Blalock determined the effects of burns on the escape of fluid into the tissue spaces of the injured area in eighteen dogs anesthetized deeply by barbital. Varying amounts of half of the body surface were burned, and the difference in weight of the two halves of the body was determined. In all instances the burned side was heavier, the average difference in weight in all experiments being 3.34 per cent. of the total weight of the dog. The author discusses the important rôle that this probably exerts in the reduction of the blood pressure.

III. Studies have been made by Beard and Blalock of the plasma of the blood and of the fluid that escaped from the blood stream at the site of the injury after mild trauma to an extremity, after trauma to the intestines, and after burns. The analyses included determinations of the content of chlorides, sugar, nonprotein nitrogen, and total protein. The fluid that escaped from the blood vessels of the injured area had approximately the same composition in all of these constituents as the plasma of the blood. Reasons are given for believing that the loss of plasma proteins at the site of injury is the most important factor in the pro-

duction of shock caused by the experimental methods used in this study.

IV. Johnson and Blalock determined the comparative effects of the removal of whole blood, of plasma, and of red blood cells in thirty-five dogs anesthetized by barbital. The results indicate that the loss of whole blood is usually tolerated better than is the loss in equal amounts of either blood plasma or red blood cells. The animals withstand the removal of a slightly larger volume of red blood cells than of blood plasma. The results obtained in these experiments are compared with those reported previously on the effects of severe trauma to an extremity, mild trauma to an extremity, intestinal trauma, and burns. They indicate that the cause for the reduction in the blood pressure after the various types of injury was the loss of whole blood or of plasma from the blood stream at the site of the trauma. It does not seem necessary to assume the action of a poison which exerts a general bodily effect.

V. Harris and Blalock determined the content in water and solids of various tissues of the body in control experiments and in those in which a low blood pressure had been produced by trauma and burns. The animals were all anesthetized by barbital and were not given water or food during the experiments. There was little difference in the content in water or solids of the tissues in the control experiments and in those in which injury had been inflicted. In additional experiments, the content in water and solids of blood, muscle, and skin was determined before and after a low blood pressure had been produced by the removal of whole blood, by the removal of blood plasma, by mild trauma to an extremity, by trauma to the intestines, and by burns. The results were compared with those obtained in experiments in which the animals were simply given barbital and left on the table for periods of time varying from twenty-six to forty-seven hours. The analyses of particular importance were those on the muscles, because they contain the greater part of the water in the body. There was a larger loss of water by the muscles in the control experiments than in those in which hemorrhage or injury was studied. Reasons are given for the belief that hemorrhage and trauma are similar in that in each there is a loss of plasma proteins with a diminution in the total osmotic pressure. After trauma there is a larger proportional loss of blood plasma and hence a relatively greater diminution in the osmotic pressure. The decrease in the colloids explains the inability of the blood stream to attract more water from the tissues. The main factor that is most likely responsible for the continued low blood pressure after injuries is not a general increase in capillary permeability, with loss of fluid all over the body, but a loss of blood plasma through the walls of the damaged capillaries.—C. K. D.

LOW BACK PAIN. *E. Margo. Abstr. as follows from Jour. Oklahoma State Med. Assn., Jan., 1931, vol. 24, p. 16, in Arch. Physical Therapy, X-Ray, Radium, Feb., 1931, vol. 12, p. 126.*

After discussing the pathogenesis, symptoms, and classification of low back pain, the author divides the management of these cases into conserva-

tive, *i.e.*, recumbent, ambulatory, and operative. Physical therapy is advocated as a form of ambulatory treatment and is considered as a part of the general scheme. The author's views are as follows:

Most cases of back sprain become dissatisfied because the average physician will only treat them by strapping. With physical therapeutic agents, you not only do something for the individual but when carried out properly they are our best method of relief. When prescribed, they must be carried out by a well-trained technician. The usual method is heat, either infra-red or diathermy. Usually the latter is most effective, and is then followed by massage. The massage should be of a scientific nature and not a rub down. This should be given for at least ten minutes following the application of heat. Medical gymnastics may also be indicated in subacute and chronic cases. With well-supervised physical measures, the period of disability in low back pain is greatly decreased as well as the degree of discomfort.

INDUSTRIAL PHYSIOLOGY: NUTRITION, METABOLISM, FATIGUE, ETC.

THE NUTRITION OF THE GERMAN AND THE AMERICAN WORKER. *von Tyszka. Abstr. as follows from Klin. Wchnschr., 1931, vol. 10, pp. 124–129, in Bull. Hyg., June, 1931, vol. 6, pp. 493–494.*

An exhaustive investigation of the income and expenditure of 896 German working class families is compared with the statistics of 100 American families dependent on the Ford motor factory. The income of the American worker is much higher in money value but is only slightly higher in purchasing power than that of the German. The American spends more in rent, house equipment, fuel and lighting, but less in food. Foodstuffs are, however, relatively much cheaper in America, particularly in the case of the more costly foods such as beef, mutton, butter, vegetables, and fruits. The American consumes considerably more meat and meat products than the German, while the German consumption of cheaper foods such as horseflesh, sausage, margarine, inferior cheese, bread, and potatoes is greater than that of the American. The diet of the American worker is thus definitely superior to that of the German, particularly in regard to the biologic value of the protein and the vitamin content. This deficiency in the German diet causes an increased liability to catarrhal conditions and influenza in the winter and early months of the year. The economic condition of the Ford worker is undoubtedly high, but it is typical of the conditions in all large American factories. The lower nutritional standard of the German worker must affect the individual output of work and increase the working days lost through illness.

There should be a complete transformation of the agricultural policy in Germany. The high duties on cereals and foodstuffs should be abolished, and farmers, cattle and poultry breeders, fruit and vegetable producers should be encouraged in every possible way. A lowering in price of food, especially

of the more expensive types, would better enable the German worker to compete in the world markets.—H. N. H. G.

CLIMATE

SOOT PARTICLES IN NEW YORK CITY AIR. *E. E. Free. Abstr. as follows from Fuels and Steam Power (A. S. M. E. Tr.), 1931, vol. 53, pp. 9–12, in Chem. Abstr., May 20, 1931, vol. 25, p. 2503.*

Counts were made by an impact dust counter. The more important variable affecting results was the direction of the wind. Another is clumping of the soot particles, the cause of which has not been determined. An average of approximately a half-million dust and soot particles is to be found in each cubic foot of New York City air. At least 90 per cent. is ordinary soot or unburned carbon. The following were also found: auto tire rubber, asphalt, brick, rock, organic materials, slivers of glass, glazed tile, leather, cotton fiber, hair, and a few living mold spores. The size varies from 0.0001 to 0.05 inch. At 100 feet above the street level the number of soot particles decreases 25 to 50 per cent. at Fifth Avenue and Twenty-Third Street; no high level counts were made at other points. For the air over the entire city the average amount of suspended matter is 4 to 5 short tons. The relative absence of ash indicates that most of the city's soot and air dust comes from small fires in apartment houses, office buildings, and homes, rather than from smoke stacks of the large power houses or other industrial plants.—P. D.

SMOKE AND DUST ABATEMENT. *M. D. Engle. Heating, Piping and Air Conditioning, Jour. Sec. of Am. Soc. Heating and Ventil. Eng., Feb., 1931, vol. 3, pp. 146–157.*

This is an informative review, well-illustrated, of practical methods and apparatus. A useful and very practical bibliography is appended.—P. D.

THE AMELIORATION OF ATMOSPHERIC POLLUTION. *H. W. Green. Am. Jour. Pub. Health, March, 1931, vol. 21, pp. 237–241.*

SMOKE ERADICATION TO SAVE THE HEALTH VALUE OF URBAN SUNSHINE. *F. O. Tonney and C. R. DeYoung. Am. Jour. Pub. Health, April, 1931, vol. 21, pp. 344–354.*

This is a strong plea for smoke abatement, showing that solar ultraviolet radiation in Chicago is below the "minimal erythema dose" for three months of the year, and pretty close to the minimal for two more. Tulsa, Oklahoma City, Fort Worth, and Dallas, which burn coal or gas instead of soft coal, and are further south, lose less of the solar ultraviolet because of atmospheric pollution.

Apparently no attempt was made to show what percentage of this loss was caused by nature and what by man-made pollution.—P. D

ALLERGENES AND THEIR REMOVAL FROM AIR. *J. H. D. Blanke. Aerologist, Feb., 1931, vol. 7, pp. 24–25, 37–38; March, 1931, pp. 46–48.*

This article describes Storm van

Leeuwen's work and rather advocates the filtered air masks (positive pressure air supply) of Fraenkel and Levy. —P. D.

INDUSTRIAL MEDICAL SERVICE: MEDICAL DISPENSARIES AND HOSPITALS IN INDUSTRIAL PLANTS

LIFE CONSERVATION STUDIES. A REPORT ON ONE THOUSAND PHYSICAL EXAMINATIONS OF MALE CLERICAL WORKERS. *W. H. Muhlberg, C. P. McCord, and F. P. Allen. Cincinnati, 1931, pp. 6 (typewritten).*

Complete physical examination of 1,000 white male office workers of ages 25 and under to 65 and over revealed that 781 possessed significant physical defects. Minor physical defects only were noted for 213 men. Those essentially free from physical defects numbered six.

In rank of numbers of examinees involved, defects of dentition, weight, cardiovascular system, vision, and hearing in the order named were outstanding.

In view of the apparent causes predisposing to heart disease around 40 years, these findings are significant: Among 1,000 male office workers, 1.6 per cent. had albuminuria and 1.9 per cent. had glycosuria; hypertension was found for 12.9 per cent., and hypotension for 13 per cent.; overweight was common to 42.3 per cent. and noted in common principally with cardiovascular disease, especially for men past 45 years. It is also noteworthy that one-third of all these defects were found in men under 45 years. Not to be overlooked were 5 per cent. with heart murmurs and 12 per cent. with definite heart enlargement.

Among these 1,000 men, 361 were found with significant heart lesions. In a large number of instances defects were discovered in this study which were leading to or eventually would lead to serious physical handicap. Such conditions were unknown to 728 men who possessed them, or at least they did not admit knowing of them.

Finally, the examination records of these 728 men definitely indicated that 81 per cent. would profit by early medical care.—*Authors' Conclusion.*

LIFE CONSERVATION STUDIES. CARDIO VASCULAR LESIONS AMONG ONE THOUSAND INDUSTRIAL MACHINE OPERATORS. A REPORT OF ONE THOUSAND PHYSICAL EXAMINATIONS OF MACHINE OPERATORS. *W. Muhlberg, F. Allen, and B. Marquette. Cincinnati, 1931, pp. 9 (mimeographed).*

No effort is made to make definite deductions because of the fact that this series of studies is still in progress. We do not regard the numbers as yet as sufficient and we have not fully analyzed all of our present data. When the findings of the third study (of 1,000 negro factory workers) have been completed,[1] careful correlations will be made between the three studies and the findings will be published. We hope to be able to secure funds to extend our studies to include several other cross sectional groups including women. It is planned to keep in touch with all of the men in the groups

[1] See THIS JOURNAL, May, 1931, vol. 13, Article Section, pp. 157 and 164.

studied over a period of several years in order to determine what happens to them and also to make every effort to keep under medical care those who our studies show need it.

One definite and incontrovertible point brought out in the first two studies is the extraordinarily high incidence of physical impairments, much of which was unknown to the examinees, together with the high percentage of the men with impairments which the examiners believed could be remedied by medical care. The findings add significantly to the accumulating evidence of the importance of periodic health examinations.—*Authors' Conclusions.*

INDUSTRIAL NURSING

THE INDUSTRIAL NURSE'S INTRODUCTION TO HER JOB. *M. E. Zehring. Pub. Health Nurse, Feb., 1931, vol. 23, pp. 63–67.*

The function of the industrial nurse depends upon the attitude of the management, the product manufactured, and the type of persons employed. The nurse chosen must be of good health, of personal attractiveness, sympathetic, and capable of intelligent comprehension of the hazards involved in the plant and of giving proper treatment under physicians' orders and in emergencies. Her attitude at physical examinations may influence the reactions of new employees toward the plant; her reports may prevent recurrent accidents; in rechecking defects or in treating minor disabilities she may discover remedial causes of the ailments, with resultant time saving and expense to the employer; through home visits she may aid in correcting disadvantageous living conditions affecting the ability of the employee. She may aid the Personnel Department in creating a "healthy, intelligent, and interested working force."—A. M.

MENTAL HYGIENE ASPECTS OF THE INDUSTRIAL NURSE'S JOB. *E. S. Bixler and E. L. Coolidge. Pub. Health Nurse, Feb., 1931, vol. 23, pp. 67–69.*

In Dr. V. V. Anderson's book, "Psychiatry in Industry," a survey made in connection with R. H. Macy and Company, he states that in a total of 8,000 to 10,000 employees "approximately 20 per cent are 'problem workers,'" indicating the necessity for greater emphasis on mental hygiene training in schools of nursing, with a better understanding of both the physical and the mental aspects of disease. Employees affected by financial cares, those who are frequently accident victims, others with varied personality traits—all may be aided by an industrial nurse "better informed in mental hygiene."—A. M.

THE INDUSTRIAL NURSE'S RESPONSIBILITY IN RELATION TO HEART DISEASE. *R. B. Crain. Pub. Health Nurse, Feb., 1931, vol. 23, pp. 70–72.*

There is urgent need for all health agencies to unite in an effort to reduce the number of deaths from heart disease and to limit the amount of disability it causes. The industrial nurse is in a strategic position to aid in the supervision of the cardiac at work. By being informed of the causes of heart disease, its symptomatology, and the effect of adverse working conditions and faulty home environment in lowering or exhausting cardiac reserve,

she may do much to prevent breakdowns and loss of time.—*Author's Summary.*

THE INDUSTRIAL NURSE'S RESPONSIBILITY IN EYE HEALTH. *M. G. Smith. Pub. Health Nurse, Feb., 1931, vol. 23, pp. 75–78.*

The industrial nurse may make a valuable contribution to the eye safety and eye health of the worker if she tries to teach the value and necessity of safety devices on machinery and as worn by the workers; to demand that every eye injury, no matter how trivial, be cared for by trained persons in the medical department and that this care continue until all signs of trouble have disappeared; to secure adequate light without glare in all workrooms; and to show that eye health has a vital and practical relationship to the maintenance and upbuilding of general health. —*Author's Summary.*

RELATION OF THE INDUSTRIAL NURSE TO THE PLANT SAFETY PROGRAM. *R. P. Knapp. Pub. Health Nurse, Feb., 1931, vol. 23, pp. 82–84.*

The industrial nurse should be given opportunity to aid in a plant's safety program. Because of her more intimate contact with accident problems she may to a certain extent determine the responsibility for the accidents. She may offer suggestions in the home, to the foreman, or to the operatives if hazards or "chance taking" are observed, and in the meetings of the safety committee. The nurse may be instrumental in checking communicable diseases.—A. M.

STUDY OF NURSES IN COMMERCE AND INDUSTRY. *V. H. Hodgson. Pub. Health Nurse, Feb., 1931, vol. 23, pp. 87–89.*

An employer should recognize the standards indicated by the term "registered nurse" and should realize that the growth of industrial nursing in a plant depends upon the nurse's administrative ability. Through a study of 1,006 establishments it is found that 85 per cent. of all industrial nurses are registered; only 31.5 per cent. of all nurses reported work under written standing orders, which should be desired by the nurse as a protective measure. The nurse's program is not limited to treatments but includes a part in the development of a constructive health program of the employment, safety, and medical departments, all aiming to secure uninterrupted production.

REHABILITATION OF DISABLED EMPLOYEES

CRITICAL SURVEY. SCHEMES FOR THE EMPLOYMENT OF TUBERCULOUS PATIENTS. *J. B. McDougall. Abstr. as follows from Brit. Jour. Tuberc., April, 1930, vol. 24, p. 79, in Am. Rev. Tuberc., April, 1931, vol. 23, p. 80.*

A survey of schemes offering remunerative employment for tuberculosis patients is presented. Two English and four American workshops are described. The occupations provided are as follows: firewood making, brush making, painting, leather goods manufacture, needlework, watch repairing, jewelry and cabinet making. All are being subsidized with money or labor, or both. Thus comparison of workshops and settlements is diffi-

cult. Medical results continue to be good, but a standard form of return of the physical condition of all settlers at institutions to which settlements are attached is desirable. There is a tendency for industries in settlements to become similar. Woodwork is popular. Farming is decreasing. Village settlements cater to the few. At Papworth 1,778 cases were admitted in the first ten years, and only 123 patients, or 6.9 per cent., were admitted to the settlement. At Preston Hall, of 620 patients received from 1925 to 1928, ninety-one, or 14.2 per cent., were admitted. The work at Preston Hall is described in further detail. For the three years ending in 1929, the loss was 1.7 per cent. on a turnover of 182,192 pounds. The outstanding feature of the work done during the past twelve years is that it has been experimental, and is thus of value, irrespective of the findings.

THE INTERNATIONAL FACTORY CLINIC. *A. Rollier. Jour. State Med., April, 1931, vol. 39, pp. 219–229.*

Efforts have been made in the past to use occupation as a healing force for convalescent cases of tuberculosis; but the possibility of doing anything for surgical cases has not previously been contemplated. The author, with his wide experience, now tells how he has turned his attention to this issue with success. He holds that work is one of the essentials of life and happiness. It is a law which can never be broken with impunity; hence it is necessary to convalescents of all classes. He has devised a means by which immobilized surgical patients can use their hands for making various articles to be sold, and can actuate tools driven by electric motors to the same end. Electric power is attached to each bed; and the output of the patients is organized on a commercial basis, so that under normal conditions each one can earn enough to contribute to the expenses of his long stay under treatment. The whole effort is meeting with great success, both financially and as a means toward healing. The clinic is called an international one, because patients of so many nationalities come for treatment. The whole scheme must be studied with great interest by all who are concerned with the rehabilitation of tuberculous patients.—E. L. C.

ABSTRACT OF THE LITERATURE OF INDUSTRIAL HYGIENE

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GENERAL

INDUSTRIAL PROBLEMS FROM THE STANDPOINT OF GENERAL PRACTICE. *L. P. Lockhart. Brit. Med. Jour., Aug. 1, 1931, vol. 2, pp. 179-182.*

An interesting discourse is presented in which reasons are sought for the increased amount of sickness experienced in recent years by industrial workers. It is ascribed largely to neurasthenic diseases of psychogenic origin which become manifest under the terrifying influence of modern mechanized life. Fear and inferiority are the two outstanding reactions of the mind. Prevention must lie in efforts to allay these reactions, which can be made by medical practitioners and factory doctors. The factory clinic where personal contact can be established is of first importance for this purpose.—E. L. C.

SIXTH INTERNATIONAL CONGRESS ON OCCUPATIONAL ACCIDENTS AND DISEASES (GENEVA).

This Congress was held at Geneva from Aug. 3 to Aug. 8, 1931. It was notable as being a reunion between the two sections which had met separately on the last occasion at Budapest and at Lyons. The success of the reunion determined the managing committees to continue the combined meetings in the future; the next Congress is to meet in Brussels in 1935.

The subjects chosen for papers were the influence of previous health on recovery from industrial accidents and diseases, injuries of the blood vessels, the health of men working cement and artificial stones, the reaction of the body to industrial poisons, occupational dermatitis, and industrial fatigue.

The articles contributed are to be published later in the year. The reading of papers already published in summary, and of others not bearing on the chosen subjects, occupied all the available time at the sessions; hence no open discussions were possible. This plan was unfortunate when experts from many countries were present whose views would have been of great value. Much good work was done in conversations outside the meetings; but more should result when members have gathered from South Africa, Czechoslovakia, Australia, Austria, United States, France, Great Britain, Holland, Germany, Belgium, and Italy, and when skilled interpreters are present to aid the interchange of ideas. The next Congress should consist of less paper reading, and more discussions of contributions previously printed and circulated; otherwise the only attending members will be those invited to contribute papers.

The subjects which produced the best contributions were industrial fatigue dealt with by Professor Atzler (Germany), Dr. Dill (United States), Dr. Teruoka (Japan), and Dr. Vernon (Great Britain), and skin diseases discussed by Dr. Prosser White (Great Britain), Professor Koelsch (Germany), and Professor Oppenheim (Austria). —E. L. C.

ELEVENTH ANNUAL REPORT OF THE INDUSTRIAL HEALTH RESEARCH BOARD TO 30TH JUNE, 1931. *H. M. Stationery Office, 1931, pp. 78.*

An analytic summary is given of the activities of the Board during the last five years, as well as details of work in progress. Advances have been made in ascertaining some principal factors affecting health and efficiency. The ideal work curve, which after rising steadily to an optimum rate of output maintains this rate from hour to hour, and from day to day, until the week-end, is now so accepted as to be used to test the value of rest pauses and other factors expected to influence capacity. The temperature and cooling power of the air were found to affect health and absenteeism among coal miners who lost time as temperature rose from 70°F. to 80°F. and over. Accidents are now recognized to be a reaction to environment, similar to sickness, so that incidence rates for both rise and fall together as conditions are unfavorable or favorable; further, workers with a personal accident proneness are the less skilled and those with greater sickness incidence.

Research into weight carrying by females has shown that 40 per cent. of the body weight should not be exceeded for continuous work, and 50 per cent. for occasional loads; these values represent about 45 and 55 pounds, respectively. If the load is compact and is so handled as not to interfere with gait and balance, the loads may be exceeded. Careful inquiry into the influence of menstruation upon activity goes far to counter accepted ideas, and to establish that this fundamental physiologic rhythm in normal women is not such as to affect, either considerably or constantly, the quantity or quality of their industrial work. Facts when ascertained have also dissipated the claim, over which industrial fights have occurred, that more sickness happens to weavers employed in artificially humidified sheds than to those in other sheds.

Much light has been shed on the

vexed question of monotonous repetitive work; complete uniformity in manual activity is less productive than a reasonable degree of variety; but complete mechanization enables the operative to indulge in mind wandering or conversation, and so is an antidote to boredom. Similarly, frequent and varied reactions to unexpected situations demand constant attention and prevent boredom. But semiautomatic operations which prevent freedom of thought, but are insufficient to keep the mind fully occupied, tend to create the most intense boredom. In this matter, however, individuals vary in their reactions, and intelligent operatives tend to be the more easily bored.

Many specific investigations into sickness, eyestrain, telegraphists' cramp, and the nervous temperament are summarized. Medical advisers to industry are recommended to acquaint themselves closely with the whole of the important work which the Board has done.—E. L. C.

TWO STUDIES OF ABSENTEEISM IN COAL MINES. *H. M. Vernon, T. Bedford, and C. G. Warner. Indust. Health Res. Board, Rep. No. 62, pp. 52. H. M. Stationery Office, 1931.*

The first part of this report is a continuation of a previous report (No. 51), and relates to the absenteeism of over 10,000 underground men and 2,700 surface men for a two-year period. The two years (1927 to 1928) followed a prolonged coal strike and the men were frequently on short time; they were paid lower wages, and they worked eight hours a day underground instead of the previous seven and a half hours. Absenteeism was greatly influenced by the changed economic conditions, for when the possible earnings of the coal face workers fell 32 per cent., the time lost by voluntary absenteeism fell to a half, and that lost by sickness fell to three-fourths, but absenteeism from accidents was slightly increased. The other underground men were still more affected; when their possible earnings fell 24 per cent., their absenteeism from voluntary causes, sickness, and accidents fell 38, 20, and 17 per cent., respectively. Surface men showed reductions of 38, 15, and 14 per cent., respectively.

The absenteeism of the 5,000 men employed at two collieries was investigated before and after the introduction of pithead baths; two bathless collieries, with 5,600 men, were used as a control. The introduction of the baths was associated with a reduction in the time lost from sickness, but with an increase in the time lost voluntarily. Independent medical evidence indicated that the incidence of skin affections such as boils was distinctly diminished by the baths, and such affections as did occur became more amenable to treatment because of the increased cleanliness of the skin.

The 1927 to 1928 data confirm those obtained in 1924 to 1926 in showing that with a rise in underground temperature there was a considerable increase in sickness absenteeism (*e.g.*, when the dry bulb temperature rose from 68° to 81° the sickness absenteeism increased from 2.4 per cent. to 3.8 per cent.). There was likewise a marked increase in accident frequency. As before, the increase related chiefly to minor accidents, those entailing less than ten days' disablement being three times more numerous at an under-

ground temperature of 81° than at one of 63°. On the other hand, major accidents causing a disability of sixty days or more were rather less numerous in coal face workers at high temperatures than at low temperatures. The accident rates for the younger men corresponded fairly well with those observed in 1924 to 1925, but the coal face men of 50 and upward showed an 18 per cent. increase in frequency rate, and a 41 per cent. increase in severity rate over the figures for 1924 to 1925. The other underground men of 40 and upward showed increases of 9 and 30 per cent. on the 1924 to 1925 figures. These increases may have been due to the greater fatigue incident to the longer working day. They related especially to the men working at temperatures above 70°, and each accident to the older men entailed an absence from work which was, on an average, 22 per cent. greater than in 1924 to 1925.

Voluntary absenteeism appeared to be closely related to the labor turnover at the various collieries, for while the turnover at three groups of collieries was 3.8, 12.1, and 18 per cent., the voluntary absenteeism was 1.7, 3.3, and 4.7 per cent., respectively. The voluntary absenteeism was also related to the distance of the homes of the men from the colliery, and the distance they had to walk underground from pit bottom to working place.

The second part of the report deals with the absenteeism observed in a group of seven Scottish collieries, comprising 5,165 underground men. It appeared that the atmospheric conditions at the collieries with high sickness rates were inferior to those at the collieries where the sickness rates were low. Other factors such as housing, proximity of homes to the pit, and the wetness of working places also contributed.

The total absenteeism rates for the Scottish collieries were only a half to a third as great as those for the English collieries, but this was due largely to the fact that sickness and accidents were practically excluded from the Scottish figures. The Scottish absenteeism rate was therefore roughly comparable with the voluntary absenteeism observed in the English collieries; but even then it was distinctly lower, being 4.1 per cent. as against 5.6 per cent. The accident frequency was less in the Scottish pits than in the English, but the accident severity was the same in the two groups.

An appendix to the report, by E. P. Cathcart and J. Taylor, discusses the possible causation of varying sickness rates in certain Scottish collieries.—H. M. V.

SYSTEMIC OCCUPATIONAL DISEASES: OCCURRENCE, TREATMENT, AND PREVENTION

PUNCTATE BASOPHILIA: METHOD FOR EASY DEMONSTRATION BY DARK GROUND ILLUMINATION. *W. T. Nelson. Abstr. as follows from Med. Jour. Australia, March 14, 1931, vol. 1, p. 310, in Jour. Am. Med. Assn., June 6, 1931, vol. 96, pp. 1999–2000.*

Nelson describes the use of dark field illumination in the microscopic examination of blood films for evidence of punctate basophilia. The dark field method is far less fatiguing and time consuming than bright field methods in counting stippled cells in blood films.

Attention is drawn to the importance of examining films in a fresh condition. Punctate basophilia, as demonstrated by this method, was found of frequent occurrence in workers not apparently subjected to any single common cause of this condition. Punctate basophilia was present in a large number of those workers and in a significant proportion of red blood corpuscles. A number of workers with trinitrotoluene were examined, and similar changes demonstrated. The high stippled cell counts found in cases of disease hitherto unsuspected of being accompanied by punctate basophilia indicate the need for further investigation in this direction. In view of the unexpected high percentage of persons in whose blood evidence of stippling may be found by the dark field method, it would appear that in any individual case the significance of this change as evidence of trinitrotoluene or lead absorption is questionable.

THE OCCUPATIONAL IMPORTANCE OF HYPERTENSION. *A. Dumas. Méd. du travail, May, 1931, vol. 3, pp. 57–75.*

Occupational capacity is discussed in relation to different types of hypertension, whether associated with aortitis, with chronic nephritis, with cardiac lesions, with paroxysmal crises, or with no other detectible trouble. The author then reviews occupational requirements both from the point of view of the invalid and from the point of view of the work. Finally he concludes that physical exercise, whether that of sport or of work, does not create high blood pressure; but it renders those who have high pressure more liable to complications associated with the condition. The occupational capacity of those affected is certainly diminished because its maintenance throws extra work on the heart; nevertheless, danger is associated more with accompanying lesions of the heart or kidneys than with the degree of pressure. Anyone with high blood pressure and organic lesions should not carry on heavy physical work. Young people with high blood pressure, but no lesions, may be capable of undertaking reasonably heavy occupation; but those in middle life with a similar pressure should not do such work. The degree of high blood pressure alone is not a sufficient guide to the capacity of the subject; it is only when the association of this condition with other lesions is considered that its true importance can be evaluated.—E. L. C.

POISONOUS HAZARDS AND THEIR EFFECTS: GASES, CHEMICALS, ETC.

STUDIES IN ASPHYXIA. I. NEUROPATHOLOGY RESULTING FROM COMPARATIVELY RAPID CARBON-MONOXIDE ASPHYXIA. *J. Chornyak and R. R. Sayers. U. S. Pub. Health Rep., June 26, 1931, vol. 46, pp. 1523–1530.*

The neuropathology produced in dogs by fatal exposures of twenty to thirty minutes to 0.6 per cent. carbon monoxide in air by volume was studied.

The brain, as a whole, showed a severe perivascular and perineuronal edema. This was most marked in the corpus striatum, the cortex, and the

dorsal motor nucleus of the vagus nerve. The vessels were greatly dilated and tightly packed with red blood cells. Stasis was marked throughout. There were a few petechial hemorrhages, especially in the corpus striatum and cortex. Most of these were not larger than would occur by diapedesis through the dilated vessels. Occasionally a few leukocytes, both lymphocytes and polymorphonuclear leukocytes, were found in the perivascular spaces. The endothelium of the capillaries appeared to be swollen in some areas.

The neurons were extensively damaged. Many of the nerve cells seem to have been ruptured. In some areas all that appeared to be left of the nerve cell was a swollen, distorted, and vacuolated nucleus with a little Nissl material around it. A clear space marked the site of the original cytoplasm of the neuron. In others there was a marked central chromatolysis with distorted nuclei. This was most pronounced in the cells of the nuclei pontis. The Nissl material was dust-like in some of the very large cells, as in some of the neurons of the nucleus ruber. In others the Nissl granules were abnormally large and decreased in number. Some of the cells, especially the small pyramidal cells in the cortex and the cells of the dorsal nucleus of the vagus, were shrunken and stained homogeneously a dark blue. The nuclei were swollen, distorted in shape, and frequently eccentric. They contained very little chromatin material. Many of the nerve cells were shrunken.

Many of the large polygonal-shaped cells containing well-developed Nissl granules, located throughout the reticular formation of the brain stem showed practically no change. Likewise, the nuclei of the hypoglossal, abducens, trochlear, oculomotor nuclei, and nucleus ruber showed relatively little damage. The dorsal motor nucleus of the vagus nerve, dorsal sensory areas of the brain stem, the corpus striatum, and the cortex showed severe injury.

There was a variation in the degree of damage with different animals. With three of the four dogs studied the variation was not marked, but the fourth showed distinctly less damage. The foregoing findings were, however, present to some degree in all of the animals.

The following conclusions may be drawn:

1. The circulatory changes are characterized by dilatation, stasis, perivascular hemorrhage, and edema.

2. Edema is diffuse and severe. It is both perineuronal and perivascular.

3. There is a marked difference in the susceptibility of the nerve cells to oxygen deprivation. The cells of the cortex, corpus striatum, dorsal motor nucleus of the vagus, and the dorsal sensory areas of the medulla, are the most sensitive. The nucleus ruber, nuclei of the oculomotor, trochlear, abducens, and facial nerve, and the large polygonal cells in the reticular formation of the medulla are the least susceptible.

4. There are two general types of degenerative changes in the nerve cells following asphyxia: (*a*) Some become shrunken and stain diffusely; (*b*) others show varying degrees of chromatolysis.

5. Carbon monoxide produces a diffuse degenerative change throughout the entire brain.

6. In this type of asphyxia the most serious effect appears to be edema of the dorsal motor nucleus of the vagus and the adjacent area in the medulla oblongata.—*Authors' Summary and Conclusions.*

CHROME POISONING WITH MANIFESTATIONS OF SENSITIZATION. REPORT OF A CASE. *A. R. Smith. Jour. Am. Med. Assn., July 11, 1931, vol. 97, pp. 95–98.*

In spite of the fact that some of the compounds of chromium have markedly toxic properties when absorbed in sufficient amounts, the literature contains little evidence of the occurrence of systemic poisoning. The following case, which Dr. Smith reports as an example of both local and systemic effects of chromium is, therefore, of special interest:

A man, aged 25, an American, was admitted to the hospital, Feb. 3, 1930, complaining of ulceration of the skin of both hands, difficulty in breathing, and tenderness of the muscles of the extremities.

His family history and past history were negative with the exception of many previous attacks of hay fever and asthma. Eight months previously he had begun to work in a planographic printing establishment, where his duties involved the handling and washing of sheets of zinc which had been treated with a solution of ammonium bichromate. He also on occasion made up the solution. Shortly after he began this work, skin lesions had developed on his hands, which necessitated transference to another department, where the lesions quickly cleared up. About one month before admission, however, he returned to his original work. Almost immediately an eruption developed on both hands and also on the abdomen. Two weeks before admission he began to have asthma and a week later he noticed a marked tenderness of most of his muscles, which had become practically incapacitating by the time he entered the hospital.

On admission the temperature was 101.5° F., the pulse 88, respiration 20, and blood pressure 140 systolic and 80 diastolic. The patient was in considerable discomfort, sweating profusely, with such marked tenderness of the muscles of the extremities that movement was difficult.

The arms were held in a flexed position. The skin covering the lower third of the forearms and hands was markedly erythematous and tender. On the fingers and palms were numerous desquamating areas, with an adherent purulent undermining border. Numerous minute vesicles covered most of the dorsum of the hands and the lower part of the forearms. Interspersed between these desquamating and vesicular lesions were many shallow ulcerated lesions, some with a greenish exudate, others covered by crusts. Two similar lesions were present on the abdomen in the region of the umbilicus. The eyes, ears, and nose were normal. The teeth were in poor condition, the tongue was coated, and the pharynx was injected. Auscultation revealed numerous inspiratory and expiratory wheezes in the lungs. There were no cardiac abnormalities. The abdomen was held tight but without rigidity. No organs were palpable. The reflexes were normal. The muscles of the arms and legs were excruciatingly tender, and the overlying skin was tense, suggesting edema.

The hemoglobin was 92 per cent.; red blood corpuscles, normal in appearance, numbered 4,700,000; white blood corpuscles, 21,800; polymorphonuclear leukocytes, 80 per cent.; lymphocytes, 12 per cent.; monocytes, 7 per cent.; basophils, 1 per cent.; no eosinophils. There was polyuria and the urine showed a trace of albumin, sugar ++, a few red and white blood cells, and no casts. The fasting blood sugar was 1.14; the blood urea, 0.21. The blood Wassermann reaction was negative.

A diagnosis was made of chronic poisoning by chrome with dermatitis venenata, acute nephritis, asthma, and acute myositis of the upper and lower extremities.

The patient was kept in bed and given salicylates. The hands were cleaned surgically and dressed with boric acid ointment. Profuse diaphoresis and muscle pain, gradually diminishing, continued to cause dis-

comfort for about a week, and for this length of time the temperature remained elevated. In three or four days after admission the asthmatic breathing cleared up. By the fourth day the albumin and red blood cells had disappeared from the urine, but a slight glycosuria persisted for ten days. Chromium was not demonstrated in the urine. The leukocytosis increased to 32,760 on the third day and then gradually diminished. The ulcers were completely healed on the eleventh day after admission, leaving only a slight erythema with desquamation of the hands. February 21, eighteen days after admission, the patient had made a satisfactory recovery and was about to be discharged when he developed an acute tonsillitis which necessitated his remaining until March 5.

During the course of treatment, considerable interest was aroused by the reaction shown to certain skin tests. Three days after admission a patch test of 1 per cent. ammonium bichromate solution was applied to a normal skin area on the forearm and left in place twenty-four hours, at the end of which time an area of mild erythema, about 1 sq. cm. in area, was apparent at the site of the patch.

Three days later this area had extended to twice its original size and was covered with minute vesicles. Two control subjects showed no reaction. February 18, fifteen days after admission, an intradermal injection of 0.1 c.c. of a 0.5 per cent. solution of ammonium bichromate was made in the right forearm after a scratch test with the same solution had proved negative. No immediate reaction was observed, and three control subjects showed no reaction. In about an hour the patient developed a generalized pruritus with soreness at the site of the intradermal injection. Within six hours the patient showed (1) a slight erythema at the site of the scratch test which had previously been negative; (2) an erythematous area about 5 cm. by 3 cm. with tenderness at the site of the intradermal injection; (3) a localized patch of maculopapules on the area in which the patch test had been applied nine days previously; (4) a vesicular erythematous dermatitis covering the entire hands and the lower part of the forearms, *i.e.*, the site of the previous dermatitis; (5) a generalized mild erythema with a few urticarial wheals on the buttocks; (6) recurrence of diaphoresis and sibilant râles in the lungs. There was no recurrence of myositis, albuminuria, or glycosuria. With a return to local treatment, the skin lesions subsided in a few days. Local passive transfer of ammonium bichromate sensitivity, with the use of the patient's blood serum, was attempted on three volunteers and two guinea-pigs without success. In each instance of attempted human transfer the intradermal injection of the patient's serum was followed by a localized wheal with pseudopods, in one instance the wheal reaching a diameter of 4 cm. The exfoliated epidermis from the patient's skin lesions was extracted, sterilized, and injected intradermally into the patient and controls without reactions.

The picture presented by this case is so complicated that it is impossible to be certain how large a part was played by sensitization or by chromium intoxication. It seems probable that it should be explained as the case of an individual who became generally sensitized to chromium and was therefore poisoned by a comparatively mild exposure.

THE PATHOLOGY OF LEAD POISONING. *I. R. Petrov. Abstr. as follows from Arb. Leningrad. Inst. Gewerbehyg., 1930, vol. 3, no. 4, pp. 62–95, in Chem. Abstr., July 10, 1931, vol. 25, p. 3412.*

The pathologic picture produced by inhalation of red lead dust is identical with the picture of general lead poisoning. Of the experimental animals, the dog is the most sensitive, showing the same picture of poisoning as does man. Animals subjected to lead poisoning manifested: loss in weight, general gastro-intestinal disturbances, loss of appetite, diarrhea, constipation, colic, increase in the blood sugar at the onset

and in the middle of the period of experimental poisoning, increase in the blood cholesterol and changes in the blood picture, such as progressive anemia, appearance of punctate erythrocytes, of polychromatosis, of anisocytes and normoblasts, of a leukocytosis in some and a leukopenia in other animals, of lymphocytes and monocytes, and a general shift to the left according to Schilling. Functionally a hypertonia and tachycardia were observed. An instability in the tonicity of the circulatory vessels was accompanied by an increase or decrease in the blood pressure with corresponding changes in the pulse rate. Some animals manifested a rather stable hypotonicity and bradycardia. A heightened nervous irritability appeared in the early stages of the poisoning and a state of depression toward the end. Among the morphologic changes of the various organs were inflammatory changes and hemorrhages of the intestinal tract, necrotic changes of the liver cells, and an acute, yet not well-ramified, glomerulonephritis and nephroso-nephritis. The seat of the mechanism of the hypertonicity and the hypotonicity resides in the vasomotor nervous apparatus. The functional hypertonicity and hypotonicity are to be included among the diagnostic symptoms of lead poisoning. The contradictory evidence concerning the frequency of the occurrence of hypertonicity and hypotonicity in lead poisoning arises from the fact that investigators in the past did not perform sufficient numbers of experiments and arrested their attention on one stage of lead poisoning to the exclusion of other stages or phases of the disease. Alcohol augments the effect of lead poisoning in experimental animals and the blood pressure is considerably raised by it.—P. D.

THE FUNCTIONAL PROPERTIES OF THE CARDIOVASCULAR SYSTEM OF LABORERS MANIFESTING SYMPTOMS OF LEAD POISONING. *E. I. Lyublina. Abstr. as follows from Arb. Leningrad. Inst. Gewerbehyg., 1930, vol. 3, no. 4, pp. 96–108, in Chem. Abstr., July 10, 1931, vol. 25, p. 3412.*

Workers manifesting second-degree symptoms of lead poisoning show an increase in the maximum and minimum blood pressures, if permitted to continue their deleterious occupations under the old conditions. When subjected to a change from the horizontal to the vertical position such workers manifest an increase in the pulse rate and a reduced increase in the minimum pressure, while the lowering in the maximum pressure is more pronounced. The functional changes are due to the contraction of the blood vessels as a result of the lead poisoning. The functional properties of the cardiovascular system of workers afflicted with first-degree lead poisoning differ only slightly from those of normal individuals. A change to a non-hazardous occupation for a year or two, or a two months' abstinence from the work considerably alleviates the functional symptoms.—P. D.

LABOR CONDITIONS AND OCCUPATIONAL HAZARDS IN THE MENDELEYEV WHITE LEAD FACTORY. *Y. M. Boguslavskii. Abstr. as follows from Arb. Leningrad. Inst. Gewerbehyg., 1930, vol. 3, no. 4, pp. 161–169, in Chem. Abstr., July 10, 1931, vol. 25, p. 3413.*

The substitution of white lead by lithopone and titanium products is highly recommended. The first has been placed on a practical basis, while the sources and methods of utilization of the second are under study.—P. D.

Sanitary and Hygienic Conditions in the Newly Mechanized Process of the Manufacture of Red Lead and Litharge in the Mendeleyev Factory. *M. G. Shneiderman and B. A. Prozorov. Arb. Leningrad. Inst. Gewerbehyg., 1930, vol. 3, no. 4, pp. 170–181.*

Introduction of Labor Hygiene in the Manufacture of Accumulators. *E. A. Vigdorchik and E. N. Kupritz. Abstr. as follows from Arb. Leningrad. Inst. Gewerbehyg., 1930, vol. 3, no. 4, pp. 122–150, in Chem. Abstr., July 10, 1931, vol. 25, p. 3413.*

An extensive survey of the manufacture of accumulators with special reference to lead as a hazard to health of the laborers is made, and recommendations for the introduction of certain protective and sanitary measures are formulated.—P. D.

The Danger of Lead Poisoning in the Enameling Industry. *G. S. Erenburg. Abstr. as follows from Arb. Leningrad. Inst. Gewerbehyg., 1930, vol. 3, no. 4, pp. 231–239, in Chem. Abstr., July 10, 1931, vol. 25, p. 3412.*

Enameling of watches and jewelry is chiefly considered.—P. D.

Reorganization of the Processes of File Manufacturing as a Method of Labor Sanitation. *R. I. Azbel. Abstr. as follows from Arb. Leningrad. Inst. Gewerbehyg., 1930, vol. 3, no. 4, pp. 109–121, in Chem. Abstr., July 10, 1931, vol. 25, pp. 3412–3413.*

The use of lead in the file manufacturing industry can be eliminated entirely by using zinc (subjected previously to 400°) as lining material and by tempering the final product in "fire baths" instead of in "lead baths." (A notation appended to the article states that at the time of its publication an order has been issued by the People's Labor Committee to realize factory changes in accordance with the above.) —P. D.

An Experimental Study in the Sanitation of Labor Conditions in the Manufacture of White Powder at the Rubber Factory "The Red Triangle." *R. I. Azbel. Abstr. as follows from Arb. Leningrad. Inst. Gewerbehyg., 1930, vol. 3, no. 4, pp. 182–192, in Chem. Abstr., July 10, 1931, vol. 25, p. 3413.*

A physiologically harmless product to substitute for the lead containing compound is sought. Briquetting of the powdery ingredients, mechanization, and air-tight sealing are recommended.—P. D.

Sanitation Experiments in [Gun-] Shot Manufacture. *L. D. Pakhorukova. Abstr. as follows from Arb. Leningrad. Inst. Gewerbehyg., 1930, vol. 3, no. 4, pp. 151–160, in Chem. Abstr., July 10, 1931, vol. 25, p. 3413.*

Mechanization and air-tight sealing of the various processes of manufacturing shot have been tried experimentally as a means of eliminating danger to the worker due to lead poisoning. These sanitary measures were found effective, incidentally leading to increased production.—P. D.

HIGH-TEMPERATURE LEAD SMELTING. *E. A. Vigdorchik and E. N. Kupritz. Abstr. as follows from Arb. Leningrad. Inst. Gewerbehyg., 1930, vol. 3, no. 4, pp. 225–230, in Chem. Abstr., July 10, 1931, vol. 25, p. 3412.*

Recommendations are: (1) rapid removal of lead vapors, (2) instruction in personal hygiene, and (3) medico-prophylactic measures of the dispensary type.—P. D.

LEAD POISONING AMONG AUTOGENOUS WELDERS IN THE SCRAPPING OF NAVAL VESSELS AND MEANS FOR COMBATING IT. *L. I. Margolin. Abstr. as follows from Arb. Leningrad. Inst. Gewerbehyg., 1930, vol. 3, no. 4, pp. 205–224, in Chem. Abstr., July 10, 1931, vol. 25, p. 3412.*

The usual respirator was found inefficient and a new type of respirator is described.—P. D.

DUST HAZARDS AND THEIR EFFECTS

SILICOSIS IN A GRAVE-DIGGER. *P. W. Edwards. Lancet, June 6, 1931, vol. 1, pp. 1238–1239.*

The case is reported of a man aged 32, who had been a gravedigger for seventeen years. He died from what was manifestly silicosis associated with tuberculosis. During his work he had to make graves in red sandstone, and pneumatic drills were often employed for this purpose; in dry weather the work was so dusty that he and his colleagues were able to work for periods of only twenty minutes. This case adds another to the great variety of occupations in which a silica dust hazard exists.—E. L. C.

SILICOSIS OF THE LUNGS IN SAND BLOWERS. *P. H. Kramer. Abstr. as follows from Nederl. Tijdschr. v. Geneesk., 1930, vol. 74, pp. 4879–4883, in Bull. Hyg., May, 1931, vol. 6, pp. 404–405.*

Sandblowing for glassgrinding, cleaning of boilers, steel girders, etc., is used a good deal in Holland. The authorities have introduced a helmet to prevent inhalation of the dust, but cases of pulmonary silicosis seem to be common among these workmen, apparently owing to the insufficient use of the helmet and to unfavorable working conditions. The diagnosis of pulmonary silicosis by means of an ordinary physical examination is often difficult and the author thinks that these workmen should be subjected to an X-ray examination at regular intervals of from twelve to eighteen months. The purpose of this frequent examination would be mainly to investigate the incidence of tuberculosis in cases of silicosis of the lungs. This problem was discussed at the International Congress of Occupational Diseases at Lyons in April, 1929, where it was pointed out by many that tuberculosis is more common in people exposed to silicosis of the lungs than in any other occupation. The frequent examination of sand blowers is also recommended to ascertain whether the silicosis is spreading, and whether there is an increased tendency to bronchitis and bronchiectasis. Special attention should be paid to the heart, as myocardial degeneration and hypertrophy of the right ventricle are a common complication in these cases.—H. L.

CORNEAL REACTION TO SILICIOUS PARTICLES. *A. Policard and J. Rollet.*

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CORNEAL REACTION TO SILICIOUS PARTICLES. *A. Policard and J. Rollet.*

Abstr. as follows from Bull. hist. appl. à la physiol. et à la path., 1931, vol. 8, pp. 52–58, in Physiol. Abstr., July, 1931, vol. 16, p. 225.

A suspension of silicious dust was injected into the cornea of rabbits (connective tissue without blood vessels) and the changes followed by means of the biomicroscope; after several weeks the eye was removed, fixed, and sections were cut. Particles of the type that produce pulmonary silicosis were used; they were found to have a certain toxicity, but slowly acting, very slight, and strictly localized.—C. K. D.

STONE DUST MALADIES AMONG MINERS IN THE RUHR DISTRICT. *K. Husten. Abstr. as follows from Klin. Wchnschr., 1931, vol. 10, pp. 506–508, in Bull. Hyg., June, 1931, vol. 6, p. 467.*

Useful statistics of 240 postmortems on Ruhr miners exposed to stone dust are given; 177 could be classified as very marked silicosis of the nodular type, while in thirty-five no nodules could be found. After describing the various forms of silicosis, Husten gives the following facts: Deaths are most frequent between 50 and 55 years of age; of ninety-six of the severest cases, thirty-three died at this age and thirty-seven before it, twenty-six were over 55, but only four were over 60. Of 173 severe cases, 120, or 69 per cent., showed active tuberculosis; of the very worst cases, however, only 41 per cent. showed active tuberculosis. The youngest individual affected with the worst form was 37 years of age; 76 per cent. of the severest cases died of heart failure, 9 per cent. of tuberculosis of the lungs, 14 per cent. of pneumonia.

The duration of employment in severe silicosis varied between thirty-five and three years; the victim of silicotic changes accompanied by tuberculosis with the shortest duration of employment had worked between three and four years. On the average, however, duration of employment was between fourteen and twenty-three years.

To the question how long a miner with severe silicotic changes can live after obvious signs (dyspnea, heart insufficiency) have appeared, Husten replies that of 175 cases, nine died before going on compensation, thirty-one within the first year afterwards; after four years only thirty-six were alive and after six years, three.—T. M. L.

OCCUPATIONAL AFFECTIONS OF THE SKIN AND SPECIAL SENSES

LENS OPACITY IN FURNACE WORKERS, GLASS BLOWERS, AND OTHERS. *P. A. Jaensch. Abstr. as follows from Arch. f. Gewerbepath. u. Gewerbehyg., 1930, vol. 1, pp. 594–610, in Bull. Hyg., June, 1931, vol. 6, pp. 468–469.*

That glass blowers and other artisans who work in front of furnaces are often the subject of cataract is a fact that has been known for a long time. The special features of this form of cataract opacity at the posterior pole and splitting of the anterior capsule are well recognized. Since this has been placed by statute among the occupational diseases which may receive compensation, the diminution of wage-earning due to it becomes a point for decision.

Inasmuch as this form of cataract

comes on only after long exposure to the source of the harmful rays, the subjects are generally men past middle life, in whom there may well be senile changes in the lens; when a glass blower complains of defect of vision, and the lens is found to be the cause, the question arises how far the disease is due to the occupation and how much to other causes; it has been remarked by several observers that the large majority of such workers are in truth suffering from the occupational form; and they conclude that where there is no other obvious cause, such as glycosuria, the surgeon will not go far wrong in assuming every case to be occupational, and awarding compensation accordingly. The extent of the reduction of capacity has been worked out for the various reductions in visual acuity, and thus every individual can be treated in accordance with his deserts.

In most cases both eyes eventually become affected but usually at a considerable interval. During this time the man often has the cataract removed from the worse eye and continues his work by means of the other.

When the second eye fails, he may be able with the help of glasses to continue with the eye previously operated upon, but often he will be unable to work as before and then must seek another post with less wage; it then becomes necessary to estimate whether his disability is due entirely to his eyes, or whether advancing years have unfitted him for his old employment.

The skill which he has acquired from years of practice will often enable an old workman with imperfect sight to do better work than a younger man who has still to learn the trade, in spite of better vision and greater strength.

The accurate valuation of all these factors calls for great care on the part of the medical assessor.—H. G.

PRACTICAL OBSERVATIONS ON THE PATHOLOGY AND TREATMENT OF THE ACTION OF SULPHURETTED HYDROGEN GAS ON THE EYES. *F. Stocker. Abstr. as follows from Med. Klin., Jan. 27, 1931, vol. 27, pp. 167–168, in Bull. Hyg., June, 1931, vol. 6, p. 469.*

The author, an ophthalmic surgeon, practises in a district where there has been for many years a large factory making artificial silk by the viscose process. During that time he has treated many cases of severe inflammation and ulceration of the corneal surface of the eye. The inflammatory effects of sulphuretted hydrogen gas have at times developed into an epidemic under the influence of the Föhn (the wind coming down from the northerly lying Alps) which interferes with the atmospheric pressure and thus makes ventilation in the factory unsatisfactory. He admits that of late, owing to technical improvements, the ventilation has improved so much that the number of cases of illness has materially diminished. The condition has taken the form of minute, often confluent, lesions of the epithelial layers of the lower part of the cornea; he speaks of deep ulcerative processes.

Some workers succumb in the first days of their employment; others remain unaffected for years. Those liable to the condition do not become acclimatized but, on the contrary, become apparently more susceptible.

Noninflammatory ointments, such as vaseline, or equal parts of vaseline and lanolin, have been found most

serviceable; washing with boric acid is to be avoided. Diocaine gives much better results in the relief of pain than cocaine.—T. M. L.

INDUSTRIAL ENVIRONMENTAL CONDITIONS

Effective Temperature—What It Means. *E. F. Adolph. Heating, Piping and Air Conditioning, June, 1931, vol. 3, pp. 483–486.*

This is an able treatment of the subject by a physiologist who took part in much of the original work at Pittsburgh with development of the effective temperature scale. Dr. Adolph emphasizes the fact that "the mean temperature of the skin surface is the same for all combinations of conditions that have the same effective temperature value." The author concludes with the following sentence:

"Certainly enough information is now available so that it can, at least, be realized that the location of every point on the effective temperature chart has a rational basis."—P. D.

Cooling our Homes. *J. E. Bullard. Aerologist, June, 1931, vol. 7, pp. 16–17.*

The domestic field undoubtedly offers a bigger market for air conditioning than the industrial field. "Never before in the history of the world has there been such a demand for comfort in the home, or so much money available to satisfy the desire as is the case today."

Heat and Moisture Losses from Men at Work and Application to Air Conditioning Problems. *F. C. Houghten, W. W. Teague, W. E. Miller, and W. P. Yant. Heating, Piping and Air Conditioning, Jour. Sec. of Am. Soc. Heating and Ventil. Eng., June, 1931, vol. 3, pp. 493–504.*

1. This report contains data in the form of curves giving the rate of total heat loss, heat loss by radiation and convection, and heat loss by evaporation for men working at three constant rates in still air at various temperatures and two humidities. Corresponding curves for these losses with subjects seated at rest are also given.

2. Data for practical application and examples showing how they may be used in the solution of problems in air conditioning are presented.

3. A table showing the metabolic rate for different kinds of activity is given and the application to practical problems is shown.

4. Total energy production, energy loss, and heat loss are shown to be functions of effective temperature.

5. Sensible and latent heat loss are shown to be functions of dry bulb temperature and only slightly affected by relative humidity except at extreme temperatures.

6. Sensible heat loss for men working increases but little over this loss for men at rest.

7. Latent heat loss increases rapidly with physical activity and is depended upon almost solely by the body for maintaining a constant body temperature with varying rates of heat production.

8. The comfort zone for men normally clothed and working at 33,075 foot pounds per hour is given at 46° to 64° effective temperature and the comfort line at 53°.

9. The degree of perspiration experienced by men working at 33,075 foot pounds per hour is given for various temperatures and humidities.—*Authors' Summary.*

WIND VELOCITY GRADIENTS NEAR A SURFACE AND THEIR EFFECT ON FILM CONDUCTANCE. *F. C. Houghten and P. McDermott. Heating, Piping and Air Conditioning, Jour. Sec. of Am. Soc. Heating and Ventil. Eng., March, 1931, vol. 3, pp. 229–237.*

The problem before the Laboratory of the American Society of Heating and Ventilating Engineers (Pittsburgh) includes "*first*, a study of the effect of direction and location of measurement of wind velocity near a surface on the film conductance coefficient; and *second*, a study of wind velocity gradients near a wall in free space and in a confining duct. This report includes data on both phases of this subject based on the direction of the wind parallel to the surface." It was noted that "roughness of surface is the main factor affecting film conductance coefficients for any type of material used in building construction." The authors summarize their results as follows:

1. This report presents wind velocity gradient curves away from a wall in free space and away from the surface of rectangular ducts which are 6 inches and 12 inches in width. Film conductance coefficients for still and moving air for a sanded surface in a 12-inch duct and for a smooth pine surface in both a 6-inch and a 12-inch duct are also presented.

2. Wind velocity gradients for free space extend to distances of 10.2, 13.2, and 13.7 inches from the wall for velocities of 10, 20, and 30 miles per hour, respectively.

3. For the same velocity in the center of rectangular ducts of different sizes the gradient is steepest near the surface of the smaller duct. This is accompanied by a steeper temperature gradient and a higher film conductance.

4. Temperature gradients are shown to vary with the size of the duct and the wind velocity. For a 20° temperature difference and velocities of 5 miles per hour and higher, the temperature gradient lies within 1 inch of the surfaces. For velocities down to 1 mile per hour, the gradients extend to as far as $1\frac{1}{2}$ inches from the surface.

5. Film conductances for a number of surfaces reported here and elsewhere are shown to vary between 1.4 and 2.1 for still air and between the limits of the simple equations:

$$f = 1.4 + 0.281v$$

and $$f = 2.1 + 0.515v$$

where v = the velocity in miles per hour

Film conductance is largely a function of roughness for the surfaces considered and can probably be expressed from a gradation of roughness of surfaces. A rough approximation of such a gradation and the equation for the coefficients are presented.

AIR INFILTRATION THROUGH DOUBLE-HUNG WOOD WINDOWS. *G. L. Larson, D. W. Nelson, and R. W. Kubasta. Heating, Piping and Air Conditioning, Jour. Sec. of Am. Soc. Heating and Ventil. Eng., July, 1931, vol. 3, pp. 583–596.*

This gives many useful data, in tables and curves, for infiltration or leakage through wood windows: (*a*)

plain (both new and old), (*b*) locked, (*c*) unlocked, and (*d*) weather stripped. —P. D.

SANITARY DRINKING FACILITIES WITH SPECIAL REFERENCE TO DRINKING FOUNTAINS. *M. Correll. U. S. Dept. Labor, Women's Bur., Bull. No. 87, 1931, pp. 26.*

For abstract of this study, see THIS JOURNAL, 1931, vol. 13, Abstract Section, p. 150.

INDUSTRIAL HEALTH LEGISLATION: COURT DECISIONS: WORKMEN'S COMPENSATION AND INSURANCE

THE CHROMIUM PLATING REGULATIONS, 1931, DATED JUNE 1, 1931, MADE BY THE SECRETARY OF STATE UNDER SECTION 79 OF THE FACTORY AND WORKSHOP ACT, 1901. *Reprinted from Statutory Rules and Orders, 1931, No. 455. H. M. Stationery Office, 1931, pp. 4.*

In pursuance of Section 79 of the Factory and Workshop Act, 1901, I hereby make the following Regulations and direct that they shall apply to all factories and workshops or parts thereof in which the electrolytic plating or oxidation of metal articles by the use of an electrolyte containing chromic acid or other chromium compounds is carried on.

These Regulations may be cited as "The Chromium Plating Regulations, 1931," and shall come into force on August 1, 1931.

Definitions[1]

Electrolytic chromium process means the electrolytic plating or oxidation of metal articles by the use of an electrolyte containing chromic acid or other chromium compounds.

Bath means any vessel used for an *electrolytic chromium process* or for any process subsequent thereto.

Employed means, in Regulations 3, 4, 5, 7, 8, 10, 12, and 13, employed in any process involving contact with liquid from a *bath*.

Surgeon means the Certifying Surgeon of the district or a duly qualified medical practitioner appointed by written certificate of the Chief Inspector of Factories which appointment shall be subject to such conditions as may be specified in that certificate.

Suspension means suspension from employment in any process involving contact with liquid from any *bath* by written certificate in the Health Register, signed by the *Surgeon*, who shall have power of suspension as regards all persons employed in any such process.

Exceptions

Where it is proved to the satisfaction of the Chief Inspector of Factories that by reason of exceptional circumstances in any works subject to these Regulations, or by reason of the infrequency of the process, or for other reasons, all or any of the requirements of the Regulations are not necessary for the protection of persons employed in such works, he may by certificate in writing (which he may in his discretion revoke) exempt such works from all or any of the provisions of the same, subject to

[1] Terms to which defined meanings are given are printed throughout in italics.

such conditions as he may by such certificate prescribe.

Duties

It shall be the duty of the occupier to observe Part I of these Regulations.

It shall be the duty of every person employed to observe Part II of these Regulations.

PART I

Duties of Occupiers

1. At every vessel in which an *electrolytic chromium process* is carried on, an efficient exhaust draft shall be provided by mechanical means and shall operate on the vapor or spray given off as near as may be at the point of origin, so as to prevent its entering into any room in which persons work.

2. The floors of every room containing a *bath* shall be rendered even and impervious to water, maintained in a sound condition, and washed down daily.

3. The occupier shall provide and maintain in good condition (*a*) for the use of all persons *employed*, aprons with bibs; and (*b*) for the use of those working at a *bath* loose-fitting rubber gloves of suitable length, and rubber boots or other waterproof footwear.

The aprons and bibs shall be of sufficient length and suitable material, which in the case of persons working at a *bath* shall be rubber, leather, or some other impermeable material.

4. The occupier shall provide and maintain for the use of all persons *employed* suitable accommodation for the storage and adequate arrangements for the drying of the protective clothing required under Regulation 3.

5*a*. The occupier shall provide and maintain in a cleanly state and in good repair for the use of all persons *employed* a lavatory, under cover and conveniently accessible, with a sufficient supply of clean towels, renewed daily, and of soap, nail brushes, and suitable ointment, and with either:

i. A trough with a smooth impervious surface, fitted with a waste pipe without plug, and of such length as to allow at least 2 feet for every five such persons, and having a constant supply of warm water from taps or jets above the trough at intervals of not more than 2 feet; or

ii. At least one lavatory basin (which in the case of lavatories installed after August 1, 1931, shall be not less than 20 inches long by 7 inches deep) for every five such persons, fitted with a waste pipe and plug or placed in a trough having a waste pipe, and having either a constant supply of hot and cold water or warm water laid on, or (if a constant supply of heated water be not reasonably practicable) a constant supply of cold water laid on and a supply of hot water always at hand when required for use by persons *employed*.

Provided that the provision of suitable ointment in the lavatory shall not be required, if every person *employed* is kept constantly supplied with a collapsible tube containing such ointment.

b. This Regulation shall also extend to persons engaged in subsequent polishing or finishing by aid of mechanical power involving exposure to chromium oxide or other compounds of chromium.

6. There shall be provided and maintained at suitable points, conveniently accessible at all times to all persons employed:

a. An adequate supply of wholesome drinking water from a public

main or from some other source of supply approved in writing by the local authority of the district in which the factory is situated, which shall be either laid on, or contained in a suitable vessel:

b. (Except where the water is delivered in an upward jet from which the workers can conveniently drink) at least one suitable cup or drinking vessel at each point of supply, with facilities for rinsing it in drinking water.

Each drinking water supply shall be clearly marked "Drinking Water."

All practicable steps shall be taken to preserve the water and vessels from contamination.

7. The occupier shall make such arrangements for first aid treatment of injuries to persons *employed* as will comply with the requirements laid down for factories in Section 29 (i) of the Workmen's Compensation Act, 1923, and in addition shall see that each first aid box is provided with a sufficient supply of ointment and impermeable waterproof plaster.

8*a*. Every person *employed* shall be examined by the *Surgeon* once in every fourteen days, or at such other intervals as may be specified in writing by the Chief Inspector of Factories, on a day of which due notice shall be given to all concerned, and such examinations shall normally be made at the factory or workshop.

b. A Health Register containing the names of all persons *employed* shall be kept in a form approved by the Chief Inspector of Factories.

c. No person after *suspension* shall be *employed* without written sanction from the *Surgeon*, entered in or attached to the Health Register.

9. A young person under the age of 18 years shall not be allowed to work at a *bath*.

Provided that this Regulation shall not apply to any young person already so employed on August 1, 1931.

10. The occupier shall see that the official Cautionary Placard as to the effects of chrome on the skin is affixed in the works in such a position as to be easily read by the persons *employed*, and shall arrange for inspection of the hands and forearms of all persons *employed* to be made twice a week by a responsible person, and for a record of such inspections to be kept in the Health Register.

Part II

Duties of Persons Employed

11. No person employed shall misuse or without the concurrence of the occupier or responsible person in charge interfere with any appliance provided in pursuance of these Regulations.

12. Every person *employed* shall wear the protective clothing provided under Regulation 3, and shall deposit the protective clothing when not being worn in the place provided under Regulation 4.

13*a*. Every person *employed* shall present himself at the appointed time for examination by the *Surgeon* in pursuance of Regulation 8*a*.

b. No person after *suspension* shall work in any process involving contact with liquid from any *bath* without written sanction from the *Surgeon*, entered in or attached to the Health Register.

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